UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

In re ASTRAZENECA PLC SECURITIES LITIGATION	Case No. 1:21-cv-00722-JPO CLASS ACTION **AMENDED COMPLAINT FOR VIOLATIONS OF THE FEDERAL SECURITIES LAWS** DEMAND FOR JURY TRIAL

Lead Plaintiffs Nuggehalli Balmukund Nandkumar and Wayne County Employees' Retirement System (collectively, "Lead Plaintiffs") and Plaintiff Vladimir Zhukov ("Additional Plaintiff" and together with Lead Plaintiffs, "Plaintiffs"), individually and on behalf of all others similarly situated, by Plaintiffs' undersigned attorneys, make the allegations set forth herein based upon knowledge as to Plaintiffs' own acts and upon the investigation of Plaintiffs' counsel. This investigation included, *inter alia*, a review of the U.S. Securities and Exchange Commission ("SEC") filings of AstraZeneca plc ("AstraZeneca" or the "Company"), Company press releases, analyst reports, media reports, other publicly disclosed reports and information about the Company, and consultation with experts. Plaintiffs' investigation is ongoing, and Plaintiffs believe that substantial additional evidentiary support will exist for the allegations set forth herein after a reasonable opportunity for discovery.

NATURE OF THE ACTION

1. This is a securities class action on behalf of all purchasers of AstraZeneca American Depositary Shares ("ADSs") between June 15, 2020 and January 29, 2021, inclusive (the "Class Period"), against AstraZeneca and certain of its executive officers, seeking to pursue remedies under the Securities Exchange Act of 1934 (the "Exchange Act").

2. AstraZeneca is one of the largest biopharmaceutical companies in the world and was one of the early front-runners in the race to develop a COVID-19 ("Covid") vaccine. In April 2020, the Company partnered with the University of Oxford ("Oxford") to develop a potential recombinant adenovirus vaccine for the virus, later dubbed AZD1222. Defendants (defined below) publicly discussed the progress they were making to develop the vaccine and touted how their trials were studying the efficacy of the vaccine candidate on elderly people, who were at heightened risk of severe, and potentially fatal, cases of Covid.

3. Defendants, however, misrepresented facts regarding AstraZeneca's AZD1222 clinical trials and concealed problems that had arisen in the trials, including a dosing error that had been discovered by Defendants ***before the Class Period even began***, but was not disclosed to investors.

4. On November 23, 2020, AstraZeneca issued a press release announcing the results of an interim analysis of its ongoing AZD1222 trials. The announcement immediately raised questions among analysts and industry experts. AstraZeneca disclosed that the interim analysis involved two smaller-scale trials in disparate locales (the United Kingdom and Brazil) that, for unexplained reasons, employed two different dosing regimens. One clinical trial provided patients a half dose of AZD1222 followed by a full dose, while the other trial provided two full doses. Counterintuitively, AstraZeneca claimed that the half-dosing regimen was substantially more effective at preventing Covid – at 90% efficacy – than the full-dosing regimen, which had achieved just 62% efficacy.

5. In the days that followed, additional revelations were made regarding problems with the AZD1222 clinical trials. For example, the differing dosing regimens were revealed to be due to a manufacturing error rather than trial design. AstraZeneca and Oxford acknowledged that they knew about the dosing error by no later than June 5, 2020. Also, the half-strength dose had not been tested in people over the age of 55 – despite the fact that this population was the most vulnerable to Covid, and Defendants had specifically said they were testing this age group. Moreover, certain trial participants received their second dose much later than originally planned.

6. The effect of these trial miscues cannot be understated. United States regulators stated that if AstraZeneca could not clearly explain the discrepancies in its trial results, the results would most likely not be sufficient for approval for commercial sale in the United States.

7. In response to these and other partial disclosures of the truth to investors, the price of AstraZeneca's ADSs declined significantly. As a result of Defendants' wrongful acts and omissions, Plaintiffs and other Class members have suffered substantial losses and damages.

JURISDICTION AND VENUE

8. The claims asserted herein arise under Sections 10(b) and 20(a) of the Exchange Act, 15 U.S.C. §§78j(b) and 78t(a), and Rule 10b-5 (17 C.F.R. §240.10b-5). Jurisdiction is conferred by Section 27 of the Exchange Act (15 U.S.C. §78aa).

9. Venue is proper in this District pursuant to Section 27 of the Exchange Act. The acts and transactions giving rise to the violations of law complained of occurred in part in this District, including the dissemination of false and misleading statements into this District. AstraZeneca's sponsored ADSs traded in this District on the New York Stock Exchange ("NYSE"), as well as on the Nasdaq Global Select Market ("NASDAQ") after the Company transferred the U.S.-listing of its ADSs on September 24, 2020.

10. In connection with the acts and conduct alleged in this Complaint, Defendants, directly or indirectly, used the means and instrumentalities of interstate commerce, including, but not limited to, the mails and interstate wire and telephone communications.

PARTIES

11. Lead Plaintiff Nuggehalli Balmukund Nandkumar, as set forth in the Certification attached hereto and incorporated herein by reference, purchased AstraZeneca ADSs at artificially inflated prices during the Class Period and was damaged thereby.

12. Lead Plaintiff Wayne County Employees' Retirement System, as set forth in the Certification attached hereto and incorporated herein by reference, purchased AstraZeneca ADSs at artificially inflated prices during the Class Period and was damaged thereby.

13. Additional Plaintiff Vladimir Zhukov, as set forth in the Certification previously filed with the Court and incorporated herein by reference, purchased AstraZeneca ADSs at artificially inflated prices during the Class Period and was damaged thereby.

14. Defendant AstraZeneca is a multinational biopharmaceutical company. AstraZeneca shares traded on the NYSE and the NASDAQ under ticker symbol "AZN" during the Class Period, and each AstraZeneca ADS represents one half of an ordinary share.

15. Defendant Pascal Soriot ("Soriot") was Chief Executive Officer ("CEO") and a director of AstraZeneca at all relevant times.

16. Defendant Marc Dunoyer ("Dunoyer") was Chief Financial Officer ("CFO") and a director of AstraZeneca at all relevant times.

17. Defendant Menelas Pangalos ("Pangalos") was Executive Vice President of Biopharmaceuticals Research & Development at AstraZeneca at all relevant times. Pangalos also served as AstraZeneca's chief scientist.

18. Defendants Soriot, Dunoyer, and Pangalos are referred to herein as the "Individual Defendants," and along with AstraZeneca, as "Defendants." During the Class Period, the Individual Defendants ran the Company as hands-on managers overseeing AstraZeneca's operations and finances and made the materially false and misleading statements described herein. The Individual Defendants had intimate knowledge about core and high profile aspects of AstraZeneca's financial and business operations, including the development of the Company's Covid vaccine as detailed herein. They were also intimately involved in deciding which disclosures would be made by AstraZeneca regarding the vaccine's ongoing clinical trials.

SUBSTANTIVE ALLEGATIONS

19. AstraZeneca is one of the largest biopharmaceutical companies in the world. The Company is headquartered in Cambridge, England, and it maintains its North American headquarters

in Wilmington, Delaware, a global research and development center in Gaithersburg, Maryland, and a primary commercial and manufacturing hub in Boston, Massachusetts. AstraZeneca is primarily known for its development of drugs to treat cancer, asthma, and other chronic conditions, and has not historically specialized in vaccine development.

The Covid Pandemic Spreads Around the World

20. In early January 2020, the World Health Organization ("WHO") announced the discovery of a new coronavirus strain in China, later called COVID-19 or Covid. The virus causes a variety of adverse symptoms in victims, including in some cases a severe acute respiratory illness that can be life threatening. The disease is highly contagious and has caused approximately four million deaths around the world (and counting), as well as debilitating symptoms in more than 180 million people afflicted with the virus.

21. On January 23, 2020, Chinese authorities placed the 11 million-person city of Wuhan under quarantine in an effort to contain the rapid spread of the virus. On January 30, 2020, the WHO declared Covid a global public-health emergency, and the next day the U.S. banned foreign nationals from entering the country if they had traveled to China within the prior two weeks. Shortly thereafter, the U.S. declared Covid a public-health emergency.

22. By February 2020, Covid had begun to have a significant impact on global markets, as consumer demand plummeted and governments began to impose lockdowns and other restrictions. By February 9, 2020, the death toll in China had surpassed that of the SARS epidemic of the early 2000s. Between February 12 and 21, 2020, the international expansion of Covid accelerated, with South Korea, Iran, and Italy suffering outbreaks. On February 25, 2020, San Francisco declared a local emergency, with several California counties following suit over the ensuing week. The U.S. reported its first death from Covid on February 29, 2020 (though later reports would confirm that earlier deaths had in fact occurred). Shortly thereafter, U.S. state and

local governments began imposing limitations on business and social activities in an effort to stop the spread of the virus.

23. The devastation wrought by Covid spurred an unprecedented campaign by governments and biopharmaceutical companies to develop treatments and vaccines for the virus. The U.S. Food and Drug Administration ("FDA") slashed regulatory hurdles and employed its emergency use authorization powers to speed up drug development, dramatically shortening the timeframe in which new drugs for Covid could be brought to market. Indeed, according to Defendant Pangalos, although the process of developing a new vaccine normally takes 15-16 years, AstraZeneca reached the stage of seeking emergency use authorization for its Covid vaccine in less than one year.

24. The U.S. government also launched Operation Warp Speed, a public-private partnership to facilitate and accelerate the development, manufacturing, and distribution of Covid vaccines, therapeutics, and diagnostics. This valiant effort resulted in rapid breakthroughs in drug development, including novel technologies such as vaccines based on synthetic mRNA.

25. However, the loosening of regulatory restrictions also increased the material importance for biopharmaceutical companies developing Covid drug candidates to maintain high quality in the conduct of clinical trials, adhere to industry standards, and communicate honestly and transparently with government authorities, investors, and the general public.

26. For example, Good Clinical Practice ("GCP") is an international ethical and scientific quality standard for designing, conducting, recording, and reporting clinical trials that involve the participation of human subjects. The objective of the GCP guidance, and its relevant addenda, is to provide a unified standard for the European Union, Japan, the United States, Canada, and Switzerland to facilitate the mutual acceptance of clinical data by the regulatory authorities in these

jurisdictions. Compliance with these practices provides public assurance that the rights, safety, and well-being of trial subjects are protected, consistent with the principles that have their origin in the Declaration of Helsinki, and that the clinical trial data are credible. Some of the most pertinent GCP principles include that: (a) clinical trials should be scientifically sound, and described in a clear, detailed protocol; (b) a trial should be conducted in compliance with the protocol that has received prior institutional review board/independent ethics committee approval and/or favorable opinion; (c) systems with procedures that assure the quality of every aspect of the trial should be implemented; and (d) aspects of the trial that are essential to ensure human subject protection and reliability of trial results should be the focus of such systems. GCP also provides: (a) clinical trial protocols; (b) best practices for an institutional review board/independent ethics committee, the investigator, and the sponsor of a trial; and (c) defines the essential documents for conducting a clinical trial.

27. Because Covid vaccines will ultimately be administered to hundreds of millions of people, it is imperative that the drugs are both safe and effective and accepted as such by target populations who may be skeptical, especially in light of the regulatory shortcuts that may have been taken to bring the vaccines quickly to market.

28. To illustrate the potential skepticism vaccine manufacturers may need to overcome, a December 2020 Associated Press-NORC poll found that only about half of Americans were willing to take a Covid vaccine at the time of the survey. Any Covid vaccine will only work if target populations are willing to take it, and the failure of a biopharmaceutical company to operate openly and truthfully in the development of a Covid vaccine could undermine public confidence in the vaccination process generally.

Oxford and AstraZeneca Partner to Develop a Covid Vaccine

29. Oxford's work on developing a Covid vaccine began in January 2020, almost as soon as the virus was recognized globally. As the pandemic ravaged the world in the spring of 2020, scientists at Oxford were working on a Covid vaccine to distribute worldwide. Lacking the ability to manufacture and distribute a Covid vaccine on its own, Oxford engaged in unsuccessful discussions with GlaxoSmithKline and Merck to fulfill these roles. Oxford ultimately turned to AstraZeneca, despite its inexperience in producing vaccines.

30. In April 2020, AstraZeneca partnered with Oxford to develop a potential recombinant adenovirus vaccine for the virus. Volunteers for the first clinical trial were recruited and screened in March 2020, and a Phase I clinical trial was launched the following month. Thus, AstraZeneca and Oxford were an early front-runner in the race to develop a Covid vaccine.

31. On April 30, 2020, AstraZeneca publicly announced its partnership with Oxford. Defendant Soriot hailed the agreement, stating: "'This collaboration brings together University of Oxford's world-class expertise in vaccinology and AstraZeneca's global development, manufacturing and distribution capabilities.'" In a press release issued the same day, AstraZeneca stated, "Under the agreement, AstraZeneca would be responsible for development and worldwide manufacturing and distribution of the vaccine."

32. AstraZeneca's vaccine candidate known as AZD1222 was met with great optimism by investors and governments around the world. Unlike certain other leading vaccine candidates, AZD1222 is not based on novel mRNA technology, but rather on more tried and tested vaccine approaches. AZD1222 is also significantly less expensive and easier to store and distribute as compared to mRNA vaccine candidates, as it does not require extremely cold temperatures to maintain vaccine integrity.

33. Traditional vaccines, like AstraZeneca's, work by training the body to recognize and respond to the proteins produced by disease-causing organisms, such as a virus or bacteria. Such vaccines are made up of small or inactivated doses of the whole disease-causing organisms, or the proteins that they produce, which are introduced into the body to provoke the immune system into mounting a response. The AstraZeneca Covid vaccine is made from a weakened version of a common cold virus (known as an adenovirus) from chimpanzees. It has been modified to contain genetic material shared by the coronavirus – although it cannot cause the illness.

34. By contrast, mRNA vaccines (such as Pfizer Inc. – BioNTech's and Moderna, Inc.'s vaccines) trick the body into producing some of the viral proteins themselves. They work by using mRNA, or messenger RNA, which is the molecule that essentially puts DNA instructions into action. Inside a cell, mRNA is used as a template to build a protein. To produce an mRNA vaccine, scientists produce a synthetic version of the mRNA that a virus uses to build its infectious proteins. This mRNA is injected into the human body, whose cells use it as instructions to build viral proteins, and therefore create some of the virus's molecules themselves. These proteins are solitary, so they do not assemble to form a virus. The immune system then detects these viral proteins and starts to produce a defensive response to them.

35. In May 2020, the U.S. government made what was at the time its biggest investment in Covid vaccine development, awarding AstraZeneca up to $1.2 billion for the development and manufacturing of the vaccine in exchange for 300 million doses. The U.S. also set conditions on its investment, emphasizing enrolling older adults and people with comorbidities in the vaccine trials.

36. AstraZeneca announced that it would manufacture the vaccine at no profit during the course of the pandemic, with expenses of the vaccine expected to be offset by grants from governments and international organizations. Analysts pointed out, however, that there may be a

future commercial opportunity if re-vaccination is required post-pandemic. In a July 20, 2020 report, a Morgan Stanley analyst wrote, "[T]here has been increasing interest surrounding the potential long-term financial benefit from the COVID-19 vaccine program with Oxford University to AstraZeneca." Likewise, on August 3, 2020, an HSBC analyst wrote, "AZN does expect to make a profit post-pandemic. Should the vaccine evolve into a seasonal flu-like immunisation programme, the economics would be 'attractive.'"

37. Notably, at the time Oxford partnered with AstraZeneca, AstraZeneca did not release a full breakdown of the trial protocols to be employed at the outset of these clinical trials, as had its competitors such as Pfizer and Moderna.

38. On May 21, 2020, AstraZeneca issued a press release announcing that it had received substantial government commitments for the development of AZD1222. The press release stated, in pertinent part, as follows:

> **AstraZeneca advances response to global COVID-19 challenge as it receives first commitments for Oxford's potential new vaccine**
>
> ***Company working on a number of agreements in parallel to ensure broad and equitable supply of the vaccine throughout the world at no profit during the pandemic***
>
> ***First agreements to supply at least 400 million doses; Company has total capacity sourced for one billion doses through 2020 and into 2021; continues to increase capacity further***
>
> ***More than $1bn US BARDA investment to support development and production of the vaccine***
>
> AstraZeneca is advancing its ongoing response to address the unprecedented challenges of COVID-19, collaborating with a number of countries and multilateral organisations to make the University of Oxford's vaccine widely accessible around the world in an equitable manner.
>
> The Company has concluded the first agreements for at least 400 million doses and has secured total manufacturing capacity for one billion doses so far and will begin first deliveries in September 2020. AstraZeneca aims to conclude further

agreements supported by several parallel supply chains, which will expand capacity further over the next months to ensure the delivery of a globally accessible vaccine.

AstraZeneca today received support of more than $1bn from the US Biomedical Advanced Research and Development Authority (BARDA) for the development, production and delivery of the vaccine, starting in the fall. The development programme includes a Phase III clinical trial with 30,000 participants and a paediatric trial.

In addition, the Company is engaging with international organisations such as the Coalition for Epidemic Preparedness Innovations (CEPI), Gavi the Vaccine Alliance and the World Health Organisation (WHO), for the fair allocation and distribution of the vaccine around the world. AstraZeneca is also in discussions with governments around the world to increase access. Furthermore, AstraZeneca is in discussions with the Serum Institute of India and other potential partners to increase production and distribution.

AstraZeneca recently joined forces with the UK Government to support Oxford University's vaccine and has progressed rapidly in its efforts to expand access around the world. The Company will supply the UK starting in September and is thankful for the Government's commitment and overall work on vaccines.

Pascal Soriot, Chief Executive Officer, said: "This pandemic is a global tragedy and it is a challenge for all of humanity. We need to defeat the virus together or it will continue to inflict huge personal suffering and leave long-lasting economic and social scars in every country around the world. We are so proud to be collaborating with Oxford University to turn their ground-breaking work into a medicine that can be produced on a global scale. We would like to thank the US and UK governments for their substantial support to accelerate the development and production of the vaccine. We will do everything in our power to make this vaccine quickly and widely available."

AstraZeneca has now finalised its licence agreement with Oxford University for the recombinant adenovirus vaccine. The licensing of the vaccine, formerly ChAdOx1 nCoV-19 and now known as AZD1222, follows the recent global development and distribution agreement with the University's Jenner Institute and the Oxford Vaccine Group. AstraZeneca has also agreed to support the establishment of a joint research centre at Oxford University for pandemic preparedness research.

A Phase I/II clinical trial of AZD1222 began last month to assess safety, immunogenicity and efficacy in over 1,000 healthy volunteers aged 18 to 55 years across several trial centres in southern England. Data from the trial is expected shortly which, if positive, would lead to late-stage trials in a number of countries. AstraZeneca recognises that the vaccine may not work but is committed to progressing the clinical program with speed and scaling up manufacturing at risk.

> The Company's comprehensive pandemic response also includes rapid mobilisation of AstraZeneca's global research efforts to discover novel coronavirus-neutralising antibodies to prevent and treat progression of the COVID-19 disease, with the aim of reaching clinical trials in the next three to five months. Additionally, the Company has quickly moved into testing of new and existing medicines to treat the infection, including CALAVI and ACCORD trials underway for *Calquence* (acalabrutinib) and DARE-19 trial for Farxiga (dapagliflozin) in COVID-19 patients.[1]

39. On June 4, 2020, AstraZeneca issued a release announcing a $750 million agreement with the Coalition for Epidemic Preparedness Innovations and the Gavi Vaccine Alliance for 300 million doses of AZD1222, as well as a licensing agreement with the Serum Institute of India to supply one billion doses for low- and middle-income countries. The release claimed that clinical trials for AZD1222 (at the time known as ChAdOx1) had been preceding without any significant issues, stating that "[v]accines made from the ChAdOx1 virus have been given to more than 320 people to date and have been shown to be safe and well tolerated, although they can cause temporary side effects such as a temperature, influenza-like symptoms, headache or a sore arm."

An Undisclosed Dosing Error Materially Affects AstraZeneca's Clinical Trials

40. As Oxford and AstraZeneca concluded their first safety trial in May 2020 with no serious problems surfacing, their next step was a larger Phase II/III study, involving thousands of participants, to assess how well the vaccine worked. According to the *New York Times*, Oxford hired an outside manufacturer to produce large quantities of the vaccine for the trial. But when researchers received a sample of the vaccine and measured its strength, they noticed something strange. Using a different measurement technique than the manufacturer, Oxford found the concentration of viral particles in the vaccine to be double the level that the manufacturer had found.

41. Oxford researchers did not know which measurement to trust. They decided to use a lower-strength dose. Participants would get two injections, which were supposed to be about a

[1] Emphasis in original. Unless otherwise noted herein, all emphasis is added.

month apart. Oxford began administering the vaccine. Within a few days, participants reported fewer side effects like sore arms or slight fevers than participants had during the first trial. The Oxford researchers later identified an ingredient in the outside manufacturer's vaccine batch that had skewed their measurement upward. That confirmed they were using a half-strength dose.

42. Both AstraZeneca and Oxford informed health regulators about the half-dose followed by the full-dose error, and it was concluded that the study protocol should be amended to include recipients of this regimen (the "lower dose/standard dose" or "LD/SD" trial). The protocol was amended on June 5, 2020 – less than two weeks before the start of the Class Period – resulting in enrollment of two distinct groups with different dosing regimens with no pause in enrollment. The LD/SD cohort (aged 18–55 years) was enrolled over 11 days between May 31 and June 10, 2020. At no point during the study were subjects older than 55 years of age added to the LD/SD cohort.

43. Defendants did not disclose the dosing error to investors before or during the Class Period, despite repeatedly discussing the Phase II/III trials and their purported impact on elderly trial subjects.

DEFENDANTS' MATERIALLY FALSE AND MISLEADING STATEMENTS AND OMISSIONS DURING THE CLASS PERIOD

44. The Class Period begins on Monday, June 15, 2020. On Saturday, June 13, 2020, AstraZeneca issued a press release announcing an agreement with Europe's Inclusive Vaccines Alliance to supply up to 400 million doses of AZD1222. The press release also highlighted "the start of a Phase II/III UK trial of AZD1222 in about 10,000 adult volunteers" launched by Oxford the previous month. In response, AstraZeneca's stock price rose by 2.3% on June 15, 2020, the next trading day.

45. On July 15, 2020, UK media began to report hints of data from AstraZeneca's Phase I/II vaccine trial that was provided by an unnamed "senior source." For instance, *The Telegraph* reported that the Company's vaccine candidate was producing both antibodies and Killer T-cells in healthy patients who received the medication, which could be critical, particularly as some reports suggested that antibodies developed in recovering Covid patients may not be lasting. The senior source told *The Telegraph*, "I can tell you that we now know the Oxford vaccine covers both bases - it produces both a T cell and an antibody response. It's the combination of these two that will hopefully keep people safe." News of the early data sent AstraZeneca's shares up more than 7% on July 15, 2020.

46. On July 17, 2020, AstraZeneca ADSs reached their Class Period – and all-time – high of $61.10 per share. According to *Fortune*, "Investors flock[ed] to AstraZeneca's shares since the tie-up with Oxford [was] announced, sending them to all-time highs and making the company the most valuable in the FTSE 100 share index."

47. On July 20, 2020, AstraZeneca issued a press release providing interim results for ongoing AZD1222 clinical trials. The release stated that AZD1222 had exhibited a promising immune system response in patients with no notable adverse reactions. The press release stated, in pertinent part, as follows:

> *Interim data showed strong antibody and T-cell responses*
>
> Interim results from the ongoing Phase I/II COV001 trial, led by Oxford University, showed AZD1222 was tolerated and generated robust immune responses against the SARS-CoV-2 virus in all evaluated participants.
>
> COV001 is a blinded, multi-centre, randomised controlled Phase I/II trial with 1,077 healthy adult participants, aged 18-55 years. It assessed a single dose of AZD1222 against a comparator meningococcal conjugate vaccine, MenACWY. Ten participants also received two doses of AZD1222 one month apart.
>
> The results published in *The Lancet* confirmed a single dose of AZD1222 resulted in a four-fold increase in antibodies to the SARS-CoV-2 virus spike protein

in 95% of participants one month after injection. In all participants, a T-cell response was induced, peaking by day 14, and maintained two months after injection.

Neutralising activity against SARS-CoV-2 (as assessed by the MNA80 assay) was seen in 91% of participants one month after vaccination and in 100% of participants who received a second dose. The levels of neutralising antibodies seen in participants receiving either one or two doses were in a similar range to those seen in convalescent COVID-19 patients. Strong correlations were observed across neutralisation assays.

The early safety responses confirmed that transient local and systemic reactions were common in the AZD1222 group and were comparable to previous trials and other adenoviral vector vaccines. They included temporary injection site pain and tenderness, mild-to-moderate headache, fatigue, chills, feverishness, malaise and muscle ache. No serious adverse events were reported with AZD1222, and reactions were lessened with the use of prophylactic paracetamol, a pain killer, and occurred less frequently after a second dose.

Professor Andrew Pollard, Chief investigator of the Oxford Vaccine Trial at Oxford University and co-author of the trial, said: "The interim Phase I/II data for our coronavirus vaccine shows that the vaccine did not lead to any unexpected reactions and had a similar safety profile to previous vaccines of this type. The immune responses observed following vaccination are in line with what we expect will be associated with protection against the SARS-CoV-2 virus, although we must continue with our rigorous clinical trial programme to confirm this. We saw the strongest immune response in participants who received two doses of the vaccine, indicating that this might be a good strategy for vaccination."

Mene Pangalos, Executive Vice President, BioPharmaceuticals R&D, said: "We are encouraged by the Phase I/II interim data showing AZD1222 was capable of generating a rapid antibody and T-cell response against SARS-CoV-2. While there is more work to be done, today's data increases our confidence that the vaccine will work and allows us to continue our plans to manufacture the vaccine at scale for broad and equitable access around the world."

Late-stage Phase II/III trials are currently underway in the UK, Brazil and South Africa and are due to start in the US. Trials will determine how well the vaccine will protect from the COVID-19 disease and measure safety and immune responses ***in different age ranges*** and at various doses.

(Footnotes omitted.)

48. The statements referenced in ¶¶44 and 47 above, regarding the positive interim results and tests being underway in different age ranges, were materially false and/or misleading when made because they failed to disclose the following adverse facts pertaining to AstraZeneca's Phase II/III

clinical trials, which were known to or recklessly disregarded by Defendants: (a) the Phase II/III clinical trials for AZD1222 had suffered from a critical manufacturing error, resulting in a portion of trial participants receiving half the designed dosage; (b) the Phase II/III clinical trials for AZD1222 consisted of a patchwork of disparate patient subgroups, each with subtly different treatments, undermining the validity and import of the conclusions that could be drawn from the clinical data across these disparate patient populations; (c) certain Phase II/III clinical trial participants for AZD1222 had not received a second dose at the designated time points, but rather received the second dose up to several weeks after the dose had been scheduled to be delivered according to the original trial design; (d) AstraZeneca had failed to include a substantial number of patients over 55 years of age in its Phase II/III clinical trials for AZD1222, and no patients over 55 in the half-dose regimen, despite this patient population being particularly vulnerable to the effects of Covid and thus a high priority target market for the drug; (e) AstraZeneca's Phase II/III clinical trials for AZD1222 had been hamstrung by widespread flaws in design, errors in execution, and a failure to properly coordinate and communicate with regulatory authorities and the general public; (f) the Phase II/III clinical trials for AZD1222 failed to follow relevant and applicable protocols and guidelines, including, without limitation, the guidelines for Good Clinical Practice; (g) as a result of (a)-(f) above, the Phase II/III clinical trials for AZD1222 had not been conducted in accordance with industry best practices and acceptable standards, and the data and conclusions that could be derived from the Phase II/III clinical trials was of limited utility; and (h) as a result of (a)-(g) above, AZD1222 was unlikely to be approved for commercial use in the U.S. in the short term, one of the largest potential markets for the drug.

49. On July 30, 2020, AstraZeneca filed its financial report for the six months ended June 30, 2020 on Form 6-K with the SEC. The Form 6-K highlighted AstraZeneca's development of AZD1222, stating, in pertinent part, as follows:

> AZD1222 (SARS-CoV-2 vaccine)
>
> During the period, AstraZeneca advanced its ongoing response to address COVID-19 including licence, development and distribution agreements with the University of Oxford for the recombinant adenovirus vaccine, AZD1222.
>
> The Phase I/II COV001 trial, launched in April 2020 in the UK with more than 1,000 participants, is ongoing. Initial data was reviewed in May 2020 by a Data Safety Monitoring Board and the UK Medicines and Healthcare products Regulatory Agency, ***resulting in the advancement to the COV002 Phase II/III trial in the UK, with over 10,000 participants***.
>
> In July 2020, results from the COV001 trial were published in *The Lancet*, showing that AZD1222 was tolerated and generated robust immune responses against the SARS-CoV-2 virus in evaluated participants. Neutralising activity against SARS-CoV-2 (as assessed by the MNA80 assay) was seen in 91% of participants (32/35) one month after vaccination and in 100% (10/10) of participants who received a second dose. In all evaluated participants, a T-cell response was induced, peaking by day 14, and maintained two months after injection. The levels of neutralising antibodies seen in participants receiving either one or two doses were in a similar range to those seen in convalescent COVID-19 patients. Data from these assays correlated positively with antibody levels to the SARS-CoV-2 spike protein, as measured by Enzyme-Linked Immunosorbent Assays data on the other participants.
>
> ***COV002 has launched and has recruited almost 9,000 participants in the UK; late-stage development has begun in Brazil and South Africa***. As part of the announced agreement with BARDA, the Company anticipates the launch of a Phase III clinical trial with c.30,000 participants in the US in the third quarter of this year.

50. In the same Form 6-K, AstraZeneca reiterated that "***[l]ate stage trials are currently underway in the UK, Brazil and South Africa*** and are due to start in the US. These trials will determine how well the vaccine will protect from the COVID-19 disease and measure safety and immune responses ***in different age ranges***, at various doses." AstraZeneca further discussed its vaccine trials, in pertinent part, as follows:

> ***During the period, AstraZeneca advanced its ongoing response to address COVID-19*** including licence, development and distribution agreements with the University of Oxford for the recombinant adenovirus vaccine, AZD1222.
>
> The Phase I/II COV001 trial, launched in April 2020 in the UK with more than 1,000 participants, is ongoing. Initial data was reviewed in May 2020 by a Data Safety Monitoring Board and the UK Medicines and Healthcare products Regulatory Agency, ***resulting in the advancement to the COV002 Phase II/III trial in the UK, with over 10,000 participants***.

51. Also on July 30, 2020, AstraZeneca hosted a conference call with analysts and investors led by Individual Defendants Soriot, Dunoyer, and Pangalos to discuss the Company's second quarter 2020 earnings results. In his prepared remarks, Pangalos praised AstraZeneca's efforts to develop AZD1222 to date, stating, in pertinent part, as follows:

> We're really proud to be at the forefront and highly active in the pursuit of tackling the COVID-19 global health crisis.
>
> Last week, as many of you know, we published data in Lancet for our Phase I/II COV001 trial as part of our collaboration with Oxford University showing that the vaccine AZD1222 was tolerated and generated robust immune response in terms of both neutralizing antibodies and T cells. ***Late-stage trials are currently ongoing in the U.K., in Brazil, in South Africa and are about to start in the United States***.

52. During the same call, Pangalos positively described the data surrounding the two-dose study. Pangalos had the following exchange with an analyst:

> **Analyst**:
>
> And then one question for Mene on the recent vaccine data published. Your perspective on the strength of the data versus competition. The market seems to have concluded it's not as competitive. So any thoughts there?
>
> **Pangalos**:
>
> So first of all, ***I think we're very pleased that both our data shows that we're getting a good level of neutralizing antibody presentation in the patients that are vaccinated with the 2 doses as well as a good T cell response. The study remains on track. As you know, we've dosed now nearly 12,000 patients around the world, in the U.K., Brazil and South Africa, and we're about to start the Phase III program in the U.S.***
>
> With regards to you saying that the vaccine looks less effects [sic], I'm not sure where you're basing it on. I know people have compared neutralizing antibody

> levels next to convalescent patients. We're showing that our antibody response is in the range of where convalescent patients are. . . . So very difficult to compare. But I would say I'm pleased that everyone's vaccine seems to be generating good neutralizing antibody responses, and now it also generates a very robust T cell response.

53. During the July 30, 2020 conference call, another analyst asked, "Is there something about the trial design, the single dose or lack of elderly patients that might constrain you there?" In response, Pangalos stated, in pertinent part, as follows:

> So the studies that we have running in the U.K., Brazil, South Africa and soon to start in the U.S. will all be 2-dose studies. And the data readouts from either the U.K. study, the Brazilian study or the South African study or a combination of those could be sufficient for regulatory approvals around the world, just to be clear.

54. During the same call, Defendants were again asked about study data concerning elderly and other at-risk patients. Pangalos had the following exchange with an analyst:

> **Analyst**:
>
> ***I wonder if you could comment to give us timing at all when you may have some data on elderly*** and also pediatric and other at-risk patients.
>
> And also, is it possible for you to pull across the U.K., South Africa, Brazil studies to get data sooner depending on differential rates of infections or really study if they have to have its own independent event rate? . . .
>
> **Pangalos**:
>
> ***So data on different age groups is coming from the Phase I study and from the Phase II part and the Phase III study we're running in the U.K., and we're getting that data in on a weekly basis***. And with regards to pulling data from U.K., Brazil and African studies, the answer is, yes, we can because the endpoints are exactly the same. So we would be able to pull the data for the filing.

55. On July 30, 2020, *Barron's* reported that "[l]ate-stage trials for [AstraZeneca's] experimental coronavirus vaccine, being developed with the University of Oxford, have also begun in the U.K., Brazil, and South Africa, the company said. The stock rose 2.8% in early trading and is now 16% up year-to-date." Describing AstraZeneca as "at the forefront of the race for a coronavirus vaccine," *Barron's* noted that the Company's Phase I/II trial results showed encouraging signs and

that AstraZeneca stock "has risen 42% since mid-March lows, driven by the company's vaccine progress."

56. The statements referenced in ¶¶49-54 above, regarding the positive trial results and tests being underway in different age ranges, were materially false and/or misleading when made because they failed to disclose the following adverse facts pertaining to AstraZeneca's Phase II/III clinical trials, which were known to or recklessly disregarded by Defendants: (a) the Phase II/III clinical trials for AZD1222 had suffered from a critical manufacturing error, resulting in a portion of trial participants receiving half the designed dosage; (b) the Phase II/III clinical trials for AZD1222 consisted of a patchwork of disparate patient subgroups, each with subtly different treatments, undermining the validity and import of the conclusions that could be drawn from the clinical data across these disparate patient populations; (c) certain Phase II/III clinical trial participants for AZD1222 had not received a second dose at the designated time points, but rather received the second dose up to several weeks after the dose had been scheduled to be delivered according to the original trial design; (d) AstraZeneca had failed to include a substantial number of patients over 55 years of age in its Phase II/III clinical trials for AZD1222, and no patients over 55 in the half-dose regimen, despite this patient population being particularly vulnerable to the effects of Covid and thus a high priority target market for the drug; (e) AstraZeneca's Phase II/III clinical trials for AZD1222 had been hamstrung by widespread flaws in design, errors in execution, and a failure to properly coordinate and communicate with regulatory authorities and the general public; (f) the Phase II/III clinical trials for AZD1222 failed to follow relevant and applicable protocols and guidelines, including, without limitation, the guidelines for Good Clinical Practice; (g) as a result of (a)-(f) above, the Phase II/III clinical trials for AZD1222 had not been conducted in accordance with industry best practices and acceptable standards, and the data and conclusions that could be derived

from the Phase II/III clinical trials was of limited utility; and (h) as a result of (a)-(g) above, AZD1222 was unlikely to be approved for commercial use in the U.S. in the short term, one of the largest potential markets for the drug.

57. On August 14, 2020, AstraZeneca issued a press release stating that the Company had finalized an agreement with the European Commission to supply 400 million doses of AZD1222. The press release continued, in pertinent part, as follows:

> Pascal Soriot, Chief Executive Officer, said: "This first vaccine agreement with the European Commission will ensure that millions of Europeans have access to the AZD1222 vaccine following its approval. With production in our European supply chain soon to be started, we hope to make the vaccine available widely and rapidly, with the first doses to be delivered by the end of 2020. I would like to thank the entire European Commission, and especially the Commissioner for Health and Food Safety, Stella Kyriakides, for their swift response in ensuring Europeans may soon be protected with a vaccine against this deadly virus, enabling our global society and economy to rebuild."
>
> In July 2020, interim results from the ongoing Phase I/II COV001 trial were published in *The Lancet* and showed AZD1222 was tolerated and generated robust immune responses against the SARS-CoV-2 virus in all evaluated participants. ***Clinical development of AZD1222 is progressing globally with late-stage Phase II/III trials ongoing in the UK and Brazil***, a Phase I/II trial in South Africa, and trials planned in the US, Japan and Russia. Results from the late-stage trials are anticipated later this year, depending on the rate of infection within the clinical trial communities.

58. The statement referenced in ¶57 above, regarding the status of the trials, was materially false and/or misleading when made because it failed to disclose the following adverse facts pertaining to AstraZeneca's Phase II/III clinical trials, which were known to or recklessly disregarded by Defendants: (a) the Phase II/III clinical trials for AZD1222 had suffered from a critical manufacturing error, resulting in a portion of trial participants receiving half the designed dosage; (b) the Phase II/III clinical trials for AZD1222 consisted of a patchwork of disparate patient subgroups, each with subtly different treatments, undermining the validity and import of the conclusions that could be drawn from the clinical data across these disparate patient populations;

(c) certain Phase II/III clinical trial participants for AZD1222 had not received a second dose at the designated time points, but rather received the second dose up to several weeks after the dose had been scheduled to be delivered according to the original trial design; (d) AstraZeneca had failed to include a substantial number of patients over 55 years of age in its Phase II/III clinical trials for AZD1222, and no patients over 55 in the half-dose regimen, despite this patient population being particularly vulnerable to the effects of Covid and thus a high priority target market for the drug; (e) AstraZeneca's Phase II/III clinical trials for AZD1222 had been hamstrung by widespread flaws in design, errors in execution, and a failure to properly coordinate and communicate with regulatory authorities and the general public; (f) the Phase II/III clinical trials for AZD1222 failed to follow relevant and applicable protocols and guidelines, including, without limitation, the guidelines for Good Clinical Practice; (g) as a result of (a)-(f) above, the Phase II/III clinical trials for AZD1222 had not been conducted in accordance with industry best practices and acceptable standards, and the data and conclusions that could be derived from the Phase II/III clinical trials was of limited utility; and (h) as a result of (a)-(g) above, AZD1222 was unlikely to be approved for commercial use in the U.S. in the short term, one of the largest potential markets for the drug.

59. On Monday, August 24, 2020, the *Financial Times* reported that the Trump Administration was considering issuing an emergency use authorization to the AstraZeneca Covid vaccine before the November 2020 presidential election, based on the results of the ongoing 10,000-patient trial rather than waiting on results of a larger 30,000-patient trial. The price of AstraZeneca ADSs increased by approximately 2% in response.

60. On August 31, 2020, AstraZeneca issued a press release claiming that the Company was committed to "the highest safety standards" and adherence to "the highest scientific and clinical standards" in its development of AZD1222. The press release quoted Soriot, who claimed that

AstraZeneca was developing AZD1222 "without cutting corners" and was following the "clear and stringent efficacy and safety standards" set by regulators. The press release stated, in pertinent part, as follows:

> *Company reiterates core values to "follow the science" and "put patients first"*
>
> AstraZeneca is today issuing a commitment to the highest safety standards and to broad and equitable access around the world for its COVID-19 vaccine AZD1222.
>
> At the heart of AstraZeneca's core values is to "follow the science" and ***adhere to the highest scientific and clinical standards***, making the safety and efficacy of the vaccine of paramount importance. ***The Company's submissions for market authorisation will meet the stringent requirements established by regulators everywhere around the world***.
>
> To this end, AstraZeneca is implementing a clinical development program that will enroll in excess of 50,000 volunteers, including 30,000 in the US, in Latin America, Asia, Europe, Russia and Africa that will provide data for ethnically diverse populations.
>
> The Company also has a core value to "put patients first" and will continue to work with governments and other organisations towards broad and equitable global access to the vaccine, scaling up manufacturing with independent parallel supply chains around the world to produce billions of doses to a consistent and high standard of safety and efficacy.
>
> Pascal Soriot, Chief Executive Officer, said: "***In recent weeks we have seen an increasing number of questions around the safety and availability of vaccines to fight this terrible COVID-19 pandemic and I want to reiterate my commitment that we are putting science and the interest of society at the heart of our work. We are moving quickly but without cutting corners, and regulators have clear and stringent efficacy and safety standards for the approval of any new medicine, and that includes this potential COVID-19 vaccine***. ***We will remain true to our values as we continue our efforts to bring this vaccine broadly and equitably to billions of people around world***."
>
> In July 2020, interim results from the ongoing Phase I/II COV001 trial were published in *The Lancet* and showed AZD1222 was tolerated and generated robust immune responses against the SARS-CoV-2 virus in all evaluated participants.
>
> AstraZeneca continues to engage with governments, multilateral organisations and partners around the world to ensure broad and equitable access to the vaccine, should clinical trials prove successful. Recent supply announcements

> with Russia, South Korea, Japan, China, Latin America and Brazil take the global supply capacity towards three billion doses of the vaccine.

61. Also on August 31, 2020, AstraZeneca issued a press release announcing that the Company was expanding U.S. clinical trials for AZD1222 into Phase III. The press release noted that AstraZeneca "is today issuing a commitment to the highest safety standards and to broad and equitable access," reiterating its core values to "'follow the science' and 'put patients first.'"

62. The statements referenced in ¶¶60-61 above, regarding AstraZenca's commitment to science and safety, were materially false and/or misleading when made because they failed to disclose the following adverse facts pertaining to AstraZeneca's Phase II/III clinical trials, which were known to or recklessly disregarded by Defendants: (a) the Phase II/III clinical trials for AZD1222 had suffered from a critical manufacturing error, resulting in a portion of trial participants receiving half the designed dosage; (b) the Phase II/III clinical trials for AZD1222 consisted of a patchwork of disparate patient subgroups, each with subtly different treatments, undermining the validity and import of the conclusions that could be drawn from the clinical data across these disparate patient populations; (c) certain Phase II/III clinical trial participants for AZD1222 had not received a second dose at the designated time points, but rather received the second dose up to several weeks after the dose had been scheduled to be delivered according to the original trial design; (d) AstraZeneca had failed to include a substantial number of patients over 55 years of age in its Phase II/III clinical trials for AZD1222, and no patients over 55 in the half-dose regimen, despite this patient population being particularly vulnerable to the effects of Covid and thus a high priority target market for the drug; (e) AstraZeneca's Phase II/III clinical trials for AZD1222 had been hamstrung by widespread flaws in design, errors in execution, and a failure to properly coordinate and communicate with regulatory authorities and the general public; (f) the Phase II/III clinical trials for AZD1222 failed to follow relevant and applicable protocols and guidelines, including, without

limitation, the guidelines for Good Clinical Practice; (g) as a result of (a)-(f) above, the Phase II/III clinical trials for AZD1222 had not been conducted in accordance with industry best practices and acceptable standards, and the data and conclusions that could be derived from the Phase II/III clinical trials was of limited utility; and (h) as a result of (a)-(g) above, AZD1222 was unlikely to be approved for commercial use in the U.S. in the short term, one of the largest potential markets for the drug.

63. On September 8, 2020, Soriot signed a "pledge" together with eight other biopharmaceutical CEOs. According to this pledge, AstraZeneca and Soriot vowed that the Company's Covid vaccine development would adhere to the highest manufacturing and clinical standards and "uphold the integrity of the scientific process." The widely publicized pledge stated, in pertinent part, as follows:

> **Biopharma leaders unite to stand with science**
>
> **Nine CEOs sign historic pledge to continue to make the safety and well-being of vaccinated individuals the top priority in development of the first COVID-19 vaccines**
>
> The CEOs of AstraZeneca (LSE/STO/NYSE: AZN), BioNTech (NASDAQ: BNTX), GlaxoSmithKline plc (LSE/NYSE: GSK), Johnson & Johnson (NYSE: JNJ), Merck (NYSE: MRK), known as MSD outside the United States and Canada, Moderna, Inc. (Nasdaq: MRNA), Novavax, Inc. (Nasdaq: NVAX), Pfizer Inc. (NYSE: PFE), and Sanofi (NASDAQ: SNY), today announced a historic pledge, outlining a united commitment to uphold the integrity of the scientific process as they work towards potential global regulatory filings and approvals of the first COVID-19 vaccines.
>
> All nine CEOs signed the following pledge:
>
> *We, the undersigned biopharmaceutical companies, want to make clear our on-going commitment to developing and testing potential vaccines for COVID-19 in accordance with high ethical standards and sound scientific principles.*
>
> *The safety and efficacy of vaccines, including any potential vaccine for COVID-19, is reviewed and determined by expert regulatory agencies around the world, such as the United States Food and Drug Administration (FDA). FDA has established clear guidance for the development of COVID-19 vaccines and clear*

criteria for their potential authorization or approval in the US. FDA's guidance and criteria are based on the scientific and medical principles necessary to clearly demonstrate the safety and efficacy of potential COVID-19 vaccines. More specifically, the agency requires that scientific evidence for regulatory approval must come from large, high quality clinical trials that are randomized and observer-blinded, with an expectation of appropriately designed studies with significant numbers of participants across diverse populations.

Following guidance from expert regulatory authorities such as FDA regarding the development of COVID-19 vaccines, consistent with existing standards and practices, and in the interest of public health, we pledge to:

- *Always make the safety and well-being of vaccinated individuals our top priority.*
- *Continue to adhere to high scientific and ethical standards regarding the conduct of clinical trials and the rigor of manufacturing processes.*
- *Only submit for approval or emergency use authorization after demonstrating safety and efficacy through a Phase 3 clinical study that is designed and conducted to meet requirements of expert regulatory authorities such as FDA.*
- *Work to ensure a sufficient supply and range of vaccine options, including those suitable for global access.*

We believe this pledge will help ensure public confidence in the rigorous scientific and regulatory process by which COVID-19 vaccines are evaluated and may ultimately be approved.

Together, these nine companies have collectively developed more than 70 novel vaccines that have helped to eradicate some of the world's most complex and deadly public health threats, underscoring their experience in clinical development and regulatory rigor, as well as their longstanding commitments to patient safety and public health. (Emphasis in original).

64. The statements referenced in ¶63 above, regarding AstraZenca's commitment to science and safety, and Soriot's pledge to only submit for emergency-use-authorization approval after demonstrating safety and efficacy through use of a single Phase III clinical study, were materially false and/or misleading when made because they failed to disclose the following adverse facts pertaining to AstraZeneca's Phase II/III clinical trials, which were known to or recklessly disregarded by Defendants: (a) the Phase II/III clinical trials for AZD1222 had suffered from a

critical manufacturing error, resulting in a portion of trial participants receiving half the designed dosage; (b) the Phase II/III clinical trials for AZD1222 consisted of a patchwork of disparate patient subgroups, each with subtly different treatments, undermining the validity and import of the conclusions that could be drawn from the clinical data across these disparate patient populations; (c) certain Phase II/III clinical trial participants for AZD1222 had not received a second dose at the designated time points, but rather received the second dose up to several weeks after the dose had been scheduled to be delivered according to the original trial design; (d) AstraZeneca had failed to include a substantial number of patients over 55 years of age in its Phase II/III clinical trials for AZD1222, and no patients over 55 in the half-dose regimen, despite this patient population being particularly vulnerable to the effects of Covid and thus a high priority target market for the drug; (e) AstraZeneca's Phase II/III clinical trials for AZD1222 had been hamstrung by widespread flaws in design, errors in execution, and a failure to properly coordinate and communicate with regulatory authorities and the general public; (f) the Phase II/III clinical trials for AZD1222 failed to follow relevant and applicable protocols and guidelines, including, without limitation, the guidelines for Good Clinical Practice; (g) as a result of (a)-(f) above, the Phase II/III clinical trials for AZD1222 had not been conducted in accordance with industry best practices and acceptable standards, and the data and conclusions that could be derived from the Phase II/III clinical trials was of limited utility; and (h) as a result of (a)-(g) above, AZD1222 was unlikely to be approved for commercial use in the U.S. in the short term, one of the largest potential markets for the drug.

65. On the afternoon of September 8, 2020, AstraZeneca officials had a conference call with the FDA concerning what AstraZeneca would need to do to win the FDA's blessing for its Covid vaccine. But, according to the *New York Times*, the AstraZeneca representatives neglected to mention a crucial development: two days earlier, on September 6, 2020, the Company had quietly

halted trials of its vaccine around the world, including a late-stage study in the U.S., without a public announcement. It acted after a participant in the UK became ill. A few hours after the FDA conference call, the story broke about the halted trials and that was how key FDA officials first heard the news. The FDA's commissioner, Dr. Stephen Hahn, was stunned by AstraZeneca's failure to disclose the halt to regulators. Because the U.S. government had pledged more than $1 billion to AstraZeneca to finance the development and manufacturing of its vaccine and to supply the United States with 300 million doses if it proved effective, FDA regulators expected to be informed of any problems.

66. Also on September 8, 2020, Soriot took part in the JPMorgan Healthcare CEO conference call series. Instead of releasing more information about the trial participant's illness publicly, he provided new details to investors in the private conference call. During the private investor call, Soriot elaborated on the reasons behind the trial pause. Soriot said the participant in question was a woman in the UK who experienced neurological symptoms consistent with the rare but serious spinal inflammatory disorder transverse myelitis. It was also reported to have emerged during the call that trials had already been halted once, in July, after a participant experienced neurological symptoms which turned out to be multiple sclerosis and unconnected to the trial.

67. According to an account of the call, "[n]o comment was provided [by Soriot] on when or if trial enrolment will resume" following the two vaccine-trial pauses due to subjects experiencing medical conditions, "rather ***Mr Soriot just expressed his confidence in the design of the trials, safety protocols and DSM*** [data safety monitoring]."

68. The statements referenced in ¶67 above, regarding the design of the trials, safety protocols, and data safety monitoring, were materially false and/or misleading when made because they failed to disclose the following adverse facts pertaining to AstraZeneca's Phase II/III clinical

trials, which were known to or recklessly disregarded by Defendants: (a) the Phase II/III clinical trials for AZD1222 had suffered from a critical manufacturing error, resulting in a portion of trial participants receiving half the designed dosage; (b) the Phase II/III clinical trials for AZD1222 consisted of a patchwork of disparate patient subgroups, each with subtly different treatments, undermining the validity and import of the conclusions that could be drawn from the clinical data across these disparate patient populations; (c) certain Phase II/III clinical trial participants for AZD1222 had not received a second dose at the designated time points, but rather received the second dose up to several weeks after the dose had been scheduled to be delivered according to the original trial design; (d) AstraZeneca had failed to include a substantial number of patients over 55 years of age in its Phase II/III clinical trials for AZD1222, and no patients over 55 in the half-dose regimen, despite this patient population being particularly vulnerable to the effects of Covid and thus a high priority target market for the drug; (e) AstraZeneca's Phase II/III clinical trials for AZD1222 had been hamstrung by widespread flaws in design, errors in execution, and a failure to properly coordinate and communicate with regulatory authorities and the general public; (f) the Phase II/III clinical trials for AZD1222 failed to follow relevant and applicable protocols and guidelines, including, without limitation, the guidelines for Good Clinical Practice; (g) as a result of (a)-(f) above, the Phase II/III clinical trials for AZD1222 had not been conducted in accordance with industry best practices and acceptable standards, and the data and conclusions that could be derived from the Phase II/III clinical trials was of limited utility; and (h) as a result of (a)-(g) above, AZD1222 was unlikely to be approved for commercial use in the U.S. in the short term, one of the largest potential markets for the drug.

69. Reacting to AstraZeneca's lack of candor surrounding the September trial pause, Professor Duncan Matthews of Queen Mary University of London stated:

> Given the global public attention on the vaccine race, the lack of publicly available information from the company and the other partners in the project is surprising.
>
> This is happening in a climate where many people would already be very reluctant to take a COVID-19 vaccine. Vaccine hesitancy and scepticism was common before the pandemic, and is not getting better: a third of Americans say they may refuse a vaccine, while in the UK only half of people would definitely agree to be vaccinated.
>
> ***There is a real risk that lack of transparency about clinical trials might fuel vaccine scepticism and ultimately lead to large sections of the population refusing vaccination***. This would impede rollout and potentially exacerbate the pandemic.

70. On October 26, 2020, AstraZeneca announced that its Covid vaccine candidate had produced a similar immune response in older and younger adults, and that adverse responses to the vaccine among the elderly were also found to be lower. "It is encouraging to see immunogenicity responses were similar between older and younger adults and that reactogenicity was lower in older adults, where the COVID-19 disease severity is higher," an AstraZeneca spokesman told CNBC via email.[2] Shares of AstraZeneca rose more than 2% on this news.

71. The statements referenced in ¶70 above, regarding the vaccine's immunogenicity responses and reactogenicity, were materially false and/or misleading when made because they failed to disclose the following adverse facts pertaining to AstraZeneca's Phase II/III clinical trials, which were known to or recklessly disregarded by Defendants: (a) the Phase II/III clinical trials for AZD1222 had suffered from a critical manufacturing error, resulting in a portion of trial participants receiving half the designed dosage; (b) the Phase II/III clinical trials for AZD1222 consisted of a patchwork of disparate patient subgroups, each with subtly different treatments, undermining the validity and import of the conclusions that could be drawn from the clinical data across these disparate patient populations; (c) certain Phase II/III clinical trial participants for AZD1222 had not

[2] Immunogenicity measures the type of immune responses that a vaccine generates and their magnitude over time. Reactogenicity represents the physical manifestation of the inflammatory response to vaccination, and can include injection-site pain, redness, swelling or induration at the injection site, as well as systemic symptoms, such as fever, myalgia, or headache.

received a second dose at the designated time points, but rather received the second dose up to several weeks after the dose had been scheduled to be delivered according to the original trial design; (d) AstraZeneca had failed to include a substantial number of patients over 55 years of age in its Phase II/III clinical trials for AZD1222, and no patients over 55 in the half-dose regimen, despite this patient population being particularly vulnerable to the effects of Covid and thus a high priority target market for the drug; (e) AstraZeneca's Phase II/III clinical trials for AZD1222 had been hamstrung by widespread flaws in design, errors in execution, and a failure to properly coordinate and communicate with regulatory authorities and the general public; (f) the Phase II/III clinical trials for AZD1222 failed to follow relevant and applicable protocols and guidelines, including, without limitation, the guidelines for Good Clinical Practice; (g) as a result of (a)-(f) above, the Phase II/III clinical trials for AZD1222 had not been conducted in accordance with industry best practices and acceptable standards, and the data and conclusions that could be derived from the Phase II/III clinical trials was of limited utility; and (h) as a result of (a)-(g) above, AZD1222 was unlikely to be approved for commercial use in the U.S. in the short term, one of the largest potential markets for the drug.

72. On November 5, 2020, AstraZeneca filed its financial report for the nine months ended September 30, 2020 on Form 6-K with the SEC. The Form 6-K highlighted AstraZeneca's development of AZD1222, stating, in pertinent part, as follows:

> AZD1222 (SARS-CoV-2 vaccine)
>
> During the period, the University of Oxford and AstraZeneca continued the recruitment of participants into the global clinical trials of the recombinant adenovirus vaccine, AZD1222, reaching c.23,000 participants across trials in the UK, Brazil, South Africa and the US.
>
> In October 2020, the EMA [European Medicines Agency] announced that the CHMP [Committee for Medicinal Products for Human Use] had started a rolling review of data for AZD1222. A rolling review is one of the regulatory tools that the EMA uses to flexibly progress the assessment of a promising medicine or vaccine

> during a public-health emergency. AZD1222 was the first potential COVID-19 vaccine to be evaluated in the EU under these arrangements.
>
> In September 2020, a voluntary pause to vaccination in the global trials was triggered following an unexplained illness in one of the participants receiving the vaccine in the UK Phase II/III trial. The standard review process for trial-safety events involves the examination of safety data by independent monitoring committees. The recommendations from the committees were shared with international regulators. The US FDA asked for additional information, issuing a "clinical hold" to the US Phase III trial during its review. All regulatory authorities subsequently confirmed that the trials were safe to resume, and enrolment has recommenced. It is commonplace that, in large-scale trials, some participants will become unwell, and every unexplained case has to be independently evaluated to ensure careful assessment of safety.
>
> Data on immunogenicity and safety of in [sic] older adults was presented at IDWeek showing AZD1222 has an acceptable tolerability profile and is immunogenic in adults above 18 years of age, ***including older adults***. Stronger immune responses were shown after a second dose given one month apart, ***across all adult age ranges. Local and systemic reactions were lower in older adults than younger adults (<55 years) and reactions were lessened after the second dose***.

73. In the same Form 6-K, AstraZeneca noted that Soriot "signed a vaccines pledge in collaboration with nine biopharmaceutical CEOs, committing to the continued safety and well-being of vaccinated individuals as the top priority in the development of the first COVID-19 vaccines."

74. Also on November 5, 2020, AstraZeneca hosted a conference call with analysts and investors led by Soriot, Dunoyer, and Pangalos to discuss the Company's third quarter 2020 earnings results. In his prepared remarks, Soriot stated: "The efforts against the COVID-19 pandemic include advancing the vaccine candidate and more importantly initiating Phase III trials for our long-acting antibody combination, ***which is incredibly promising***."

75. Similarly, Pangalos stated: "We continue to lead across multiple fronts in the global response to the COVID-19 pandemic. ***Progress has been made with our vaccine, AZD1222***, and we have now resumed dosing in all our trials globally, alongside entering a rolling regulatory review in Europe." Later in response to an analyst's question regarding the AZD1222 regulatory approval process, Pangalos stated that "there's nothing from the interactions that we've had with either the

MA or the MHRA that is giving us pause that if we demonstrate efficacy and safety in the data set that we have in the studies that are ongoing across Brazil, U.K. and Africa that we won't be able to get an approval."

76. During the November 5, 2020 earnings call, Pangalos reiterated that AstraZeneca's study included data on elderly patients. Pangalos had the following exchange with an analyst:

> **Analyst**:
>
> So in terms of the vaccine, should we be expecting early data from the 2-dose regime? ***And to what extent would there -- is there likely to be data on elderly patients?*** I'm just wondering if they were recruited slightly later into the study and the early data might just be in slightly younger cohorts.
>
> **Pangalos**:
>
> Andy Pollard has just presented a few weeks ago, you may have missed it, at an infection conference actually data from (inaudible) showed that ***the immune response in the 56 to 69 year olds and 69 and 70 and above looks very similar to the response of the 18 to 55 year olds. In that regard, we're feeling good about the immunogenicity in all the age groups that we're testing***. And we think we will have data from those age groups for the readout.

77. The statements referenced in ¶¶72-76 above, regarding the status and results of the tests, the progress of the vaccine's development, and the immune response to the vaccine in elderly patients, were materially false and/or misleading when made because they failed to disclose the following adverse facts pertaining to AstraZeneca's Phase II/III clinical trials, which were known to or recklessly disregarded by Defendants: (a) the Phase II/III clinical trials for AZD1222 had suffered from a critical manufacturing error, resulting in a portion of trial participants receiving half the designed dosage; (b) the Phase II/III clinical trials for AZD1222 consisted of a patchwork of disparate patient subgroups, each with subtly different treatments, undermining the validity and import of the conclusions that could be drawn from the clinical data across these disparate patient populations; (c) certain Phase II/III clinical trial participants for AZD1222 had not received a second dose at the designated time points, but rather received the second dose up to several weeks after the

dose had been scheduled to be delivered according to the original trial design; (d) AstraZeneca had failed to include a substantial number of patients over 55 years of age in its Phase II/III clinical trials for AZD1222, and no patients over 55 in the half-dose regimen, despite this patient population being particularly vulnerable to the effects of Covid and thus a high priority target market for the drug; (e) AstraZeneca's Phase II/III clinical trials for AZD1222 had been hamstrung by widespread flaws in design, errors in execution, and a failure to properly coordinate and communicate with regulatory authorities and the general public; (f) the Phase II/III clinical trials for AZD1222 failed to follow relevant and applicable protocols and guidelines, including, without limitation, the guidelines for Good Clinical Practice; (g) as a result of (a)-(f) above, the Phase II/III clinical trials for AZD1222 had not been conducted in accordance with industry best practices and acceptable standards, and the data and conclusions that could be derived from the Phase II/III clinical trials was of limited utility; and (h) as a result of (a)-(g) above, AZD1222 was unlikely to be approved for commercial use in the U.S. in the short term, one of the largest potential markets for the drug.

The Truth Begins to Emerge

78. On November 23, 2020, AstraZeneca issued a press release announcing the results of an interim analysis of its ongoing trial for AZD1222. Although the press release claimed that the vaccine candidate had met its primary efficacy endpoints, the announcement immediately began to raise questions among analysts and industry experts. AstraZeneca disclosed that the interim analysis involved two smaller-scale trials in disparate locales (the United Kingdom and Brazil) that, for unexplained reasons, employed two different dosing regimens. One clinical trial, involving 2,741 subjects, provided patients a half dose of AZD1222 followed by a full dose (the "lower dose/standard dose" or "LD/SD" trial). The other trial, involving 8,895 subjects, provided two full doses (the "standard dose/standard dose" or "SD/SD" trial). Counterintuitively, AstraZeneca claimed that the half-dosing regimen was substantially more effective at preventing Covid at 90%

efficacy than the full dosing regimen, which had achieved just 62% efficacy. AstraZeneca highlighted the blended "average efficacy of 70%" among the two trials, involving a total of 11,636 subjects.

79. AstraZeneca described the pooled analysis, in pertinent part, as follows:

> The pooled analysis included data from the COV002 Phase II/III trial in the UK and COV003 Phase III trial in Brazil. Over 23,000 participants are being assessed following two doses of either a half-dose/full-dose regimen or a regimen of two full doses of AZD1222 or a comparator, meningococcal conjugate vaccine called MenACWY or saline. The global trials are evaluating participants aged 18 years or over from diverse racial and geographic groups who are healthy or have stable underlying medical conditions.

80. The unexplained discrepancies, omissions, and need for multiple trials in separate locales raised red flags for investors and distinguished AstraZeneca's trial procedures from those of other biopharmaceutical companies, such as Pfizer and Moderna, that had recently released interim results for their own Covid vaccine candidates.

81. In an attempt to limit the fallout, AstraZeneca hastily put out statements defending its interim analysis and held conference calls with analysts covering the Company. The Company's responses, however, raised more questions than answers and cast further doubt on the integrity of the trials' design, data, and conclusions. Most shockingly, AstraZeneca revealed that the half-dosing regimen was not a part of the original trial design, but rather was forced upon the Company as a result of a manufacturing error discovered early in the trial process. Specifically, AstraZeneca and Oxford discovered that a contract manufacturer had under-predicted the dose of the vaccine by half in the UK trial. The dosing error was initially identified after a trial investigator noticed that volunteers were not having as much of an inflammatory response to the shot, prompting the researchers to question their vaccine supply and find that they had miscalculated the dose. As explained herein, AstraZeneca knew of this error by no later than June 5, 2020, when the Company

and Oxford informed health regulators about the half-dose followed by the full-dose error, and amended the vaccine study protocol.

82. Additional damaging revelations came to light in the following days. On November 24, 2020, the day after the results were announced, Dr. Moncef Slaoui, the head of Operation Warp Speed, told reporters that AstraZeneca's half-strength dose had not been initially tested in people over the age of 55. This raised the question of why AstraZeneca hadn't itself disclosed that important caveat, especially considering the fact that this population was the most vulnerable to Covid. Dr. Slaoui also stated that if AstraZeneca could not clearly explain the discrepancies in its trial results, the results would most likely "not be sufficient for approval" for commercial sale in the U.S. Moreover, certain trial participants received their second dose weeks later than originally planned, further calling into question the results. Finally, the trials amalgamated a "bewildering array" of experimental groups and subgroups, each receiving subtly different treatments, and inexplicably excluded certain subgroups from the reported interim analysis.

83. Analysts and reporters widely panned the faulty trial design and failure of AstraZeneca to be forthright with the public and investors, describing AstraZeneca's interim results as a "mess," riddled with "irregularities and omissions," and the product of "cherry-picked . . . data" and "very shaky science." For example, on November 25, 2020, *Wired* published a comprehensive report on AstraZeneca's botched trial results by Hilda Bastian, PhD, a health consumer advocate, entitled "The AstraZeneca Covid Vaccine Data Isn't Up to Snuff." The report stated, in pertinent part, as follows:

> ***The problems start with the fact that Monday's [November 23] announcement did not present results from a single, large-scale, Phase 3 clinical trial***, as was the case for earlier bulletins about the BNT-Pfizer and Moderna vaccines. ***Instead, Oxford-AstraZeneca's data came out of two separate studies***: one in the UK that began in May, and another in Brazil, which got started at the end of June. ***These two studies were substantially different from one another***: They

didn't have standardized dosing schemes across the trials, for one thing, nor did they provide the same "control" injections to volunteers who were not getting the experimental Covid vaccine. ***The fact that they may have had to combine data from two trials in order to get a strong enough result raises the first red flag***.

Consider that leading vaccine makers – including AstraZeneca – issued a scientific-rigor-and-integrity pledge back in September, in which they promised to submit their products for approval or emergency use authorization only "after demonstrating safety and efficacy through a Phase 3 clinical study that is designed and conducted to meet requirements of expert regulatory authorities such as FDA." ***Note the wording here: These companies did not suggest that they might claim to have demonstrated efficacy through multiple, distinct clinical studies, combined together to get enough data***. They said they would use a Phase 3 study – as in, *one big one*.[3] ***Yet AstraZeneca has already applied on the basis of this data for approval in Canada, and has plans to do the same in Britain, Europe and Brazil. The company also says it will use the data to apply for emergency use authorization in the US.***

The Food and Drug Administration's guidance for Covid-19 vaccines does allow for emergency use authorization based on interim analyses, but the same document says this must be supported by a minimum level of vaccine efficacy "for a placebo-controlled efficacy trial." ***Again: it refers to a trial.*** That is exactly what BNT-Pfizer and Moderna did. Both released the FDA-approved blueprints for their trials – called trial protocols – weeks ahead of time, with details of the calculations and statistical rules that they'd use to determine when to perform an interim analysis and how much certainty could be attached to those results. ***When BNT-Pfizer's discussions with the FDA led to changes in this plan, BNT-Pfizer explained why, and released an updated protocol. That's scientific rigor, and it matters a lot***. When a vaccine-maker specifies the rules of the game before the results start coming in, we can check their work and be confident in what they tell us at the end. We can make sure they haven't cherry-picked the data.

The Oxford-AstraZeneca story is very different, though. ***Presumably, neither of the two trials from which they combined data could have provided a clear answer on the vaccine's efficacy on its own. To make things worse, Oxford-AstraZeneca reported only the results for certain subgroups of people within each one***. (For perspective on this: The two subgroups chosen leave out perhaps half the people in the Brazilian trial.) ***Meanwhile, one of their key claims is that giving half a dose of the vaccine on the first injection, followed by a standard dose on the second one, led to better outcomes – but neither of these trials had been designed to test this hypothesis***. ***In fact, it's since emerged that the half-dose/full-dose option started out as a mistake, and one that was only caught when some people in the study didn't have the usual high rate of adverse effects***.

[3] Emphasis in original.

There were other dosing issues, too, that haven't been explained even though dosing is the centerpiece of the press release. ***There are many different regimens in these trials – the UK study has more than two dozen arms***, meaning the volunteers were divided into that many groups according to age and how much of the vaccine would be administered and when. The doses are measured by the number of altered viral particles they contain, and the developers decided that the standard dose would be 5 x 10^{10} viral particles. ***But for many of those arms in the UK trial – as well as everyone who got the vaccine in the Brazilian trial – publicly available trial information shows that the standard dose could be between 3.5 and 6.5 x 10^{10} viral particles. The lower end of that range isn't far off from a half-dose***.

How did Oxford-AstraZeneca end up with this patched-together analysis instead of data from a single, large trial? After all, this vaccine went into Phase 3 testing before either BNT-PFizer's or Moderna's did. But in the UK, where that testing started, the Covid-19 outbreak happened to be receding. That meant results would be coming in very slowly.

A month later, a second Phase 3 trial for the vaccine started in Brazil. That one was for healthcare workers, for whom the risk of being exposed to Covid was far higher than it was for the people in the UK trial. But the two trials had other substantive differences. In the UK, for example, the volunteers who did not get the experimental Covid vaccine were injected with meningococcal vaccine; in Brazil, those in the comparison group were given a saline injection as a placebo.

Meanwhile, BNT-Pfizer and Moderna began Phase 3 trials for their coronavirus vaccines on the same day in July: Both planned to include 30,000 volunteers at the time, and both trial plans were approved by the FDA. Oxford-AstraZeneca then announced they, too, would run a 30,000-person trial in the US.

But that research on the Oxford-AstraZeneca vaccine quickly fell behind the others'. The US trial was approved by the FDA, but it didn't start recruiting people until the end of August; and just a week later, it was put on hold so the FDA could investigate a serious adverse event in the UK trial. It wasn't clear what caused the volunteer to get sick, but the FDA did not give the all-clear for Oxford-AstraZeneca's US trial to resume until Oct. 23. By then the protocol for the trial had been publicly released. It says the plan is to inject the vaccine in two standard doses, a month apart; and two people will be vaccinated for every one who gets a placebo saline injection.

So here we are at the end of November. BNT-Pfizer and Moderna have offered up a masterclass in how to do major vaccine trials quickly in a pandemic, while Oxford-AstraZeneca has, for the moment, only an assortment of smaller ones ready to look at.

But wait, more red flags! Last week, Oxford-AstraZeneca published some results from earlier in the development of the UK trial. That paper included a trial protocol for the UK study, attached as an appendix. ***Deep in that document, and***

apparently overlooked by reporters and commentators, was an eyebrow-raising suggestion: Under a section marked "Interim and primary analyses of the primary outcome," the trialists outline a plan to combine and analyze data from four clinical trials (only half of which are Phase 3), carried out in different ways on three different continents. The plan, they wrote, was to pull out results for people across these four trials, and then pool them together for what's called a meta-analysis.

The appendix doesn't say when this became the plan. We don't even know if the Oxford-AstraZeneca team followed it. In fact, it's impossible to know, at this point, just how many analyses these researchers have run, and on which data. That's a scientific red flag with flashing lights. (Again it's useful to compare this work to the BNT-Pfizer and Moderna trials, where the analyses were clearly spelled out ahead of time for everyone to see.) ***All we know for sure is that on Monday, Oxford-AstraZeneca announced results of a different interim analysis that included only volunteers from the two trials in the UK and Brazil***.

There are other problems, too. ***In the press release, Oxford-AstraZeneca reports that two of the dosing regimens "demonstrated efficacy." Presumably, none of the others did, but they didn't give specifics. Of the only two regimens they reported, one (the mistaken first half-dose, followed by a full dose at least a month later) came in at 90 percent, and the other (two standard doses at least a month apart) achieved only 62 percent efficacy. You'll see reports that the vaccine had 70 percent efficacy, on average; but that's un-knowable, because we only have numbers on these two regimens, as opposed to everyone in the trials*** – and how they arrived at those percentages isn't explained. ***As far as we know, some of this analysis could hinge on data from just a few sick people. That means the findings could be a coincidence, or they could be biased by other factors***. For example, it has since been revealed that ***the people who received an initial half-dose – and for whom the vaccine was said to have 90-percent efficacy – included no one over the age of 55. That was not the case for the standard-dosing group, however, where the reported efficacy was 62 percent. This demographic difference could be more important than the change to the size of the first dose***.

That's not the end of the problems. Overall, the Oxford-AstraZeneca trials appear to include relatively few participants over the age of 55, even though this group is especially vulnerable to Covid-19. (***People over 55 were not originally eligible to join the Brazilian trial at all***.) ***Compare that to BNT-Pfizer's trial, where 41 percent of the volunteers were over 55***. The Oxford-AstraZeneca vaccine also seems to produce relatively high rates of adverse events. . . .

84. Dr. Bastian also noted that AstraZeneca's trials were never designed to test the LD/SD hypothesis, which leaves the door open to subconscious biases creeping into the study methods or data, making the study less rigorous.

85. As later summarized by the *New York Times* in a December 8, 2020 article entitled "Blunders Eroded U.S. Confidence in Early Vaccine Front-Runner," "a pattern of communication blunders by AstraZeneca . . . has damaged the company's relationship with regulators, raised doubts about whether its vaccine will stand up to intense public and scientific scrutiny and . . . slowed the vaccine's development." The article quoted Dr. Eric Topol, a clinical trial expert at Scripps Research Institute in San Diego, who stated: "If they just were upfront on safety, on efficacy, on dosing, on everything, from the get-go, they'd be in such a better position. But what they've done now is diminish credibility, and I don't know how they're going to regain that." Dr. Topol said AstraZeneca's data stood out for the wrong reasons. "It was this hodgepodge, throwing all these different trials together and low dose, a standard dose, a dose by accident. I mean, you just can't make this stuff up," he said.

86. Given the variety of issues impacting the development of AZD1222, Geoffrey Porges, an investment analyst with SVB Leerink, in a November 23, 2020 research report, concluded: "We believe that this product will never be licensed in the U.S.," writing, in pertinent part, as follows:

> Today AstraZeneca rocked the closely monitored field of COVID vaccine by announcing that after two doses their modified chimpanzee adenovirus COVID vaccine, ChAdOx1 had achieved an average 70% efficacy after 132 infection events in their ongoing pivotal trial. ***The company is likely to be roundly criticized today for their disclosure, since the safety disclosure simply state that "no serious safety events related to the vaccine have been confirmed" which is hardly reassuring. They did not disclose any information about any actual safety events***.
>
> ***The company tried to embellish their results by highlighting a reported 90% efficacy in a relatively small sub-set of subjects in the study (n=2741) who received a modified (lower or half dose) initial vaccination, followed by a "full dose" four weeks later. They did not disclose the exact number of events in each study, or how they calculated the blended 70% efficacy for the full cohort of 11,636 subjects***. The company did not disclose any information about efficacy against severe disease ("there were no cases") ***or in sub populations such as the elderly, high risk or minority populations. The suggestion by the inventors that the small sample given the lower priming dose was evidence of superior efficacy only brings discredit to the program. We regard the data disclosure as premature and insufficient, and is likely to attract a raft of criticism*** (at least outside Oxford University and the UK).

> The companies (AZN and Vaccitech) are clearly already positioning the product as suitable for use in less developed countries, where their relatively favorable storage condition (6 months at 2-8C) may be advantageous.
>
> ***We believe that this product will never be licensed in the US. This belief is based on the design of the company's pivotal trials (which does not appear to match the FDA's requirements for representation of minorities, severe cases, previously infected individuals and elderly and other increase risk populations)***, and based on the occurrence of severe safety events (why take the risk) that resulted in the extended clinical hold on enrollment into the trials in the US.

87. In a November 23, 2020 interview with *Bloomberg News*, Porges contrasted AstraZeneca's LD/SD study of 2,700 subjects with Pfizer's study of 45,000 subjects and said that not a lot can be concluded from such a small subset in a vaccine trial. He said that he wanted to see AstraZeneca's full safety database, and emphasized the confidence he had in other Covid vaccine manufacturers that had 35,000-45,000 vaccine subjects.

88. A Guggenheim analyst expressed skepticism over AstraZeneca's spin of the trial results in a November 23, 2020 report, stating, in pertinent part, as follows:

> More work is ongoing to evaluate the half/half regimen vs. full/full regimen performance. Dr. Pangalos noted that the lower initial dose may better prime the immune system for the boost, but the company is still evaluating immunogenicity data (NAb and T cell) and anti-vector data but noted that the effect "looks real when you look at confidence intervals and values". ***While the company may have internal evidence to guide its half/ full regimen, we were unable to find anything in the public domain that would have predicted this outcome for the half/full dose regimen***. AZN-LON did publish additional data with a low-low and high-high dose regimen in its recent Lancet publication ***but none incorporating a low-high dose regimen***.

89. An analyst from Argus noted, in a November 27, 2020 report, that "the results have generated controversy as some trial participants accidentally received a halved first dose of the vaccine. In addition, the company did not test the half-strength first dose in older participants." The analyst wrote, in pertinent part, as follows:

> ***[T]he fact that the halved-first-dose regimen came about by accident rather than design has cast doubt over the reliability of the efficacy data***, and will likely complicate the company's request to regulators for emergency use authorization.

> Further complicating matters, ***AZN announced that the initial half-strength dose wasn't tested in older participants (over 55)***, who are especially vulnerable to COVID-19. By contrast, the Pfizer/BioNTech and Moderna vaccines were both tested in older patients. Given these issues, and the fact that both the Pfizer and Moderna vaccines have shown more than 90% efficacy, we believe that AstraZeneca faces a high bar for authorization.

90. Given this uncertainty, analysts at UBS, in a November 23, 2020 report, wrote that AstraZeneca's vaccine was unlikely to be approved by the FDA, stating, in pertinent part, as follows:

> It is not clear to us why the half/full regimen should work better than the full/full regimen - this could be a function of regimen or the differences in geography and infection rates. What this means for the ongoing pIII trial that recently restarted (at the full/full dose) with date 1Q/2Q next year is not clear. AZN will now try and take this pooled data to regulators that have the ability to grant conditional or early approval. ***Given FDA guidelines, the US is unlikely to be one of them and the vaccine doesn't seem to be as effective as the mRNA ones***. Storage requirements and manufacturing capacity are a plus though.

91. Defendants' failure to deal openly and honestly with investors and the general public not only undermined confidence in AZD1222, but may have eroded public trust in the Covid vaccine development process as a whole. According to Dr. Jesse L. Goodman, the FDA's chief scientist from 2009 to 2014, AstraZeneca's missteps reinforce the importance of clear, transparent communication. "People need to know what is known and what is not known so they can trust in the process," he said.

92. As negative news reports continued to reveal previously undisclosed problems and flaws in AstraZeneca's clinical trials for AZD1222, the price of AstraZeneca ADSs fell from $55.30 on November 20, 2020, to $52.60 by market close on November 25, 2020, a 5% decline in response to developing adverse news, on abnormally high volume.

93. On November 25, 2020, Pangalos batted away criticisms over the vaccine trial results, claiming "[t]he mistake is actually irrelevant." He added, "Whichever way you cut the data – even if you only believe the full-dose, full-dose data . . . We still have efficacy that meets the thresholds for approval with a vaccine that's over 60% effective." Nevertheless, Pangalos admitted, "I'm not going

to pretend it's not an interesting result, because it is – but ***I definitely don't understand it and I don't think any of us do***. It was surprising to us."

94. The next day, Soriot contradicted Pangalos and said AstraZeneca will likely run a whole new trial to test whether the regimen given a half-strength first dose is really the most effective. Soriot said, "Now that we've found what looks like a better efficacy we have to validate this, so we need to do an additional study[.]"

95. On November 26, 2020, the *Daily Mail* also reported that England's Chief Medical Officer, Professor Chris Whitty, refused to support AstraZeneca's Covid vaccine as the Company revealed it would run a new vaccine trial because the accidental LD/SD sub-group raised concerns due to the small number of subjects and the absence of anyone in the group aged over 55.

96. The *Daily Mail*, on November 26, 2020, also reported that the 90% efficacy of the LD/SD cohort was being challenged by experts because of the small number of people it was tested on. Only 2,300 volunteers were given the smaller dose and none of the volunteers were over 55 years of age, the most high-risk age group for Covid. By contrast, in the Moderna and Pfizer vaccine trials, which are about 95% effective, dosing regimens were tested on 30,000 volunteers and more than 40% of those were over 55.

97. In the same article, commenting on AstraZeneca's trial results, Professor Ian Jones, a virologist at the University of Reading, said, "That 90 per cent protection was observed in the subset that received the supposed lower dose is really good but I think that would equate to only about 15 people in the 3,000 that received it which may be too low to convince regulators of efficiency, especially if it is not quite clear what the key difference is between it and the higher dose."

98. As to concerns over the reliability of AstraZeneca's trial results due to the LD/SD and SD/SD cohorts, the *Daily Mail* reported, in pertinent part, as follows:

Oxford has also claimed that its vaccine has an average efficacy of 70 per cent, based on the 62 and 90 per cent figures, which would put the Covid jab on par with good flu vaccines.

But there have been doubts about the reliability of the 70 per cent figure because it has been crudely calculated based on the two regimens, rather than everyone in the trials of all ages.

And because so far Oxford and AstraZeneca - the British pharmaceutical firm which owns the rights to the jab - have only revealed the percentages in a press release, it is not clear how they arrived at those figures.

It means the analysis that could seal whether or not the jab is administered to millions of people globally could be based on data from a handful of people - which, again, leaves the door open for other factors to bias in the study.

For example, it has since been revealed that ***the people who received the reduced dose included no-one over the age of 55 - who are most vulnerable to falling seriously ill or dying from Covid***, according to Ms Bastian.

That was not the case for the normal dosed group, ***raising questions about whether the demographic - rather than dosing - difference is the true driver behind the boosted efficacy***.

The Oxford-AstraZeneca study appears to include few participants over the age of 55, even though the vaccine is being targeted at elderly people.

Wired reports that people in that demographic were not originally eligible to join the Brazilian trial at all - compared [to] Pfizer's trial, where 41 per cent were over 55.

Another flaw, according to Ms Bastian, came from the simple fact the results have been combined from two separate trials in the UK and Brazil, as opposed to one single large-scale study like Pfizer and Moderna's vaccines.

Oxford originally planned to conduct a single trial in the UK when it launched its phase three study in May, but coronavirus began to fizzle out over summer which meant not enough volunteers were getting infected naturally.

A month later a second phase three trial was started in Brazil where transmission had begun to spike.

But the consequence of splitting the trial in half was that researchers could not control variables as tightly as they could in one single trial done by the same team.

There wasn't a standardised dosing regimen across both trials and control groups in the studies were not given the same fake vaccine to compare to the Covid jab.

> Participants in Brazil were given a saline injection as a placebo, whereas the British arm of the study were given a vaccine for meningitis - which creates an unfair comparison.

99. Pfizer's former president of global research, John LaMattina, raised the prospect that AstraZeneca's vaccine may not be approved for emergency use in the U.S. He tweeted, on November 24, 2020, that it was "hard to believe" that regulators would give the green light to a vaccine "whose optimal dose has only been given to 2,300 people."

100. Moreover, AstraZeneca did not immediately disclose that the dosing difference was the result of an early manufacturing mistake. To that end, AstraZeneca executives said they were planning a new study of the half-dose regimen that would include people over 55. Pangalos said, in an interview during the week of November 23, 2020, that a new study looking at over-55 subjects of the half-dose regimen would take some time. "We've got to set up the study, we've got to start recruiting," he said.

101. On December 8, 2020, AstraZeneca and Oxford published their full data from the Phase II/III trials in the British medical journal *The Lancet*. According to *The Lancet*, the interim analysis of the efficacy and safety of AstraZeneca's Covid vaccine included data from four ongoing blinded, randomised, controlled trials done across three countries: COV001 (phase 1/2; UK), COV002 (phase 2/3; UK), COV003 (phase 3; Brazil), and COV005 (phase 1/2; South Africa). The interim efficacy, however, was being assessed by a pre-specified global pooled analysis combining data from only COV002 and COV003.

102. *The Lancet* article stated that the study was originally planned as a single-dose study. However, the protocol was modified to a two-dose regime, following an amendment on July 30, 2020, for the remaining phase 2 cohorts as a result of robust booster responses identified in the evaluation of the early immunogenicity cohorts, with the booster dose given at the earliest possible time.

103. *The Lancet* article explained the genesis of the LD/SD group in AstraZeneca's vaccine trial, stating, in pertinent part, as follows:

> COV002 is a continuing single-blind phase 2/3 study in the UK that began on May 28, 2020, and enrolled participants in 19 study sites in England, Wales, and Scotland. Enrolment particularly targeted individuals working in professions with high possible exposure to SARS-CoV-2, such as health and social care settings.
>
> Two dosage groups were included in COV002: participants who received a low dose of the vaccine ($2{\cdot}2 \times 10^{10}$ viral particles) as their first dose and were boosted with a standard dose (in the LD/SD group), and subsequent cohorts who were vaccinated with two standard-dose vaccines (SD/SD group). ***Initial dosing in COV002 was with a batch manufactured at a contract manufacturing organisation using chromatographic purification. During quality control of this second batch, differences were observed between the quantification methods (spectrophotometry and quantitative PCR [qPCR]) prioritised by different manufacturing sites***. In consultation with the national regulator (Medicines and Healthcare products Regulatory Agency), we selected a dose of 5×10^{10} viral particles by spectrophotometer ($2{\cdot}2 \times 10^{10}$ viral particles by qPCR), in order to be consistent with the use of spectrophotometry in the phase 1 study (COV001), and to ensure the dose was within a safe and immunogenic range according to measurements by both methods. ***A lower-than-anticipated reactogenicity profile was noted in the trial, and unexpected interference of an excipient with the spectrophotometry assay was identified***. ***After review and approval by the regulator***, it was concluded that ***the qPCR (low-dose) reading was more accurate and further doses were adjusted to the standard dose (5×10^{10} viral particles) using a qPCR assay. The protocol was amended on June 5, 2020***, resulting in enrolment of two distinct groups with different dosing regimens with no pause in enrolment (version 6.0; appendix 2 p 330). A suite of assays has now been developed for characterisation of concentration (which confirmed the low and standard dosing), and future batches are all released with a specification dose of $3{\cdot}5–6{\cdot}5 \times 10^{10}$ viral particles, and this was used for the booster doses in the efficacy analysis presented here.
>
> ***The LD/SD cohort (aged 18–55 years) was enrolled over 11 days between May 31 and June 10, 2020***. The SD/SD cohort (aged 18–55 years) was enrolled from June 9 to July 20, 2020. ***Subsequently, enrolment of older age cohorts began*** (from Aug 8, 2020, for participants aged 56–69 years and from Aug 13, 2020, for participants aged ≥70 years), ***all of whom were assigned to two standard doses (SD/SD cohort)***. Each site implemented the protocol amendment before changing from low-dose administration to standard-dose administration, and therefore there was no overlap in enrolment of participants in these cohorts.
>
> ***The 18–55-year-old cohorts were originally planned as single-dose efficacy cohorts***. However, the protocol was modified on July 20, 2020, to offer a second dose to the participants in these cohorts as a result of robust booster responses identified in the evaluation of the early immunogenicity cohorts (version 9.0;

> appendix 2 pp 331–332). Boosting began on Aug 3, 2020, resulting in a longer gap between prime and booster vaccines in these cohorts than for those aged 55–69 years and those aged 70 years or older, as these participants were enrolled into two-dose groups from the start.
>
> Results for participants enrolled into immunogenicity subgroups have been previously published, including a small subset who received a low-dose boost. Full details are available in the study protocol (appendix 2 pp 184–342) and the procedures have been previously described. (Footnotes omitted.)

104. *The Lancet* also noted that "[t]he timing of priming and booster vaccine administration varied between studies." The article stated, in pertinent part, as follows:

> The timing of priming and booster vaccine administration varied between studies. As protocol amendments to add a booster dose took place when the trials were underway, and owing to the time taken to manufacture and release a new batch of vaccine, ***doses could not be administered at a 4-week interval***. 1459 (53·2%) of 2741 participants in COV002 in the LD/SD group received a second dose at least 12 weeks after the first (median 84 days, IQR 77—91) and only 22 (0·8%) received a second dose within 8 weeks of the first. The median interval between doses for the SD/SD group in COV002 was 69 days (50–86). Conversely, the majority of participants in COV003 in the SD/SD group (2493 [61·0%] of 4088) received a second dose within 6 weeks of the first (median 36 days, 32–58; appendix 1 p 11).

105. Underscoring the lack of vaccine recipients over 55 years of age, *The Lancet* article stated, "***[v]accine efficacy in older age groups could not be assessed but will be determined, if sufficient data are available, in a future analysis after more cases have accrued***."

106. The purported efficacy of the LD/SD cohort shocked even the study authors. According to *The Lancet*, "[e]fficacy of 90.0% seen in those who received a low dose as prime in the UK ***was intriguingly high*** compared with the other findings in the study. Although ***there is a possibility that chance might play a part in such divergent results***, a similar contrast in efficacy between the LD/SD and SD/SD recipients with asymptomatic infections provides support for the observation[.]"

107. Analysts and media reacted negatively to the information published in *The Lancet*. For example, a Morningstar analyst, in a December 8, 2020 report, wrote:

> Following the release of the pooled pII/III data via press release (here), *The Lancet* (here) has now published the data. As has been widely discussed (here) the trial included a cohort of patients that by mistake were given the wrong dose resulting in different levels of efficacy. Because of changes in trial protocols some patients also didn't get their booster vaccine as planned and in particular the patents in the 'wrong' cohort received their booster after 8 weeks (4 weeks was the plan). ***Because of all these moving parts today's publication adds helpful detail but doesn't change the fact that this is a pooled analysis of trials done at speed. Which regulator will accept the data and which one will require further confirmation remains to be seen***. The company had already provided the confidence intervals of the different groups and the vaccine works clearing hurdles at the lower end of the confidence interval that are encouraging. These confidence intervals are wide though and there are severe adverse events. Maybe most interestingly the effect on asymptomatic disease seems to trail the effect on symptomatic disease. But AZN has 3bn doses promised for 2021.

108. A Barclays analyst, in a December 8, 2020 report, noted: "One data point missing from today's releases was any confirmatory plans around a broader study of the LD/SD regimen; press reports have indicated a new global trial could be initiated shortly[.]" The analyst added, "[w]e would note that the vast majority [of] the data analyzed here (including all of the LD/SD data) is from participants aged 18-55. Older aged groups were recruited into the trials later than younger age groups and there has been less time for cases to accrue, resulting in efficacy data in these cohorts being limited to a small number of cases."

109. On December 9, 2020, Dr. Andrew Berens, an SVB Leerink analyst, commented, in pertinent part, as follows:

> Yesterday, AstraZeneca (AZN, OP) published in *The Lancet* the interim safety and efficacy data for the viral vector coronavirus vaccine AZD1222 (ChAdOx1 nCOV-19), which included data across four trials in the UK, Brazil and South Africa (link here). The data are consistent with prior communications showing that vaccine efficacy was 62% in patients receiving two standard doses (SD/SD) and 90% in patients receiving a low dose followed by a standard dose (LD/SD). ***However, the publication highlights a number of variances in the dosing regimens utilized in these trials that could make it difficult for the regulatory agencies to have confidence in the optimum dosing protocol for full approval without additional studies. The publication highlights the need for additional data to determine whether the LD/SD protocol is truly superior to the SD/SD protocol, given the number of imbalances in the arms of the existing trials***. AZN intends to submit the data to regulatory authorities around the world and will be seeking Emergency Use

> Listing from the World Health Organization for an accelerated pathway for use in low-income countries.
>
> ***An accumulation of many variables limits reliability of the datasets. Some of the study's limitations include a small number of patients that used the LD/SD (n=1367 vs. n=4440 treated with SD/SD in UK and Brazil), imbalance in age (favors LD/SD arm), imbalance in co-morbidities (favors LD/SD arm), differing local protocols, variances in the timing of the second vaccine dose, and a change in dose quantification from spectrophotometer to qPCR after the vaccine had already been given to some subjects***.
>
> Different local protocols and varied timing of priming and booster vaccine administration may confound the results. ***Besides the LD/ SD and SD/SD dosing difference across the trials, different trial sites across countries also used different protocols***. For example, the timing of priming and booster vaccine administration significantly varied between studies. ***Given that COV002 and COV003 were originally designed as single-dose efficacy cohorts, when the protocol was amended to add a second dose, the additional booster dose required time to manufacture and, therefore, some subjects could not be administered the next dose at a 4-week interval. About 53% of participants in COV002 in the LD/SD group received the second dose at least 12 weeks after the first, and only 22 subjects (0.8%) received a second dose within 8 weeks of the first. The median interval between doses for the SD/SD group in COV002 was 69 days. On the other hand, 61% of participants in COV003 in the SD/SD group received a second dose within 6 weeks of the first with a median of 36 days (Exhibit 4). Overall, the efficacy results could be confounded by these different factors, making it difficult to interpret the outcome***.

110. An HSBC analyst, in a December 9, 2020 report, raised similar doubts, writing, in pertinent part, as follows:

> 90% efficacy questions continue: While the primary efficacy end-point on the intended dosing schedule (full dose + full dose) was 62% and there were similar results from the studies in the UK and Brazil, ***the data with the 90% efficacy group (low dose + full dose) remain unconvincing. First, the much higher efficacy at the lower dose needs explanation as it is anomalous; and secondly, as the authors note, the 95% confidence intervals are wide and they overlap the confidence intervals in the intended dose group; thirdly, the justifications for the pooling of some of the data with patients of different ages and from double- and single-blinded studies again is open to argument regarding validity***.

111. Dr. Simon Clarke, an associate professor in cellular microbiology at the University of Reading, in a December 10, 2020 article, said the findings present "regulators with something of a dilemma." "Data are most compelling for the cohort who got half a dose of the vaccine in their first

jab," he explained. "Unfortunately, this cohort was relatively small, reducing the reliability of the findings – moreover it did not contain any older participants (age 55 or over) and it remains possible that if the regulators allowed the vaccine to be used in this manner, the most at risk group may not be protected."

112. Also on December 8, 2020, *Reuters* and *Postmedia Breaking News*, a Canadian publication, published articles entitled, "Testing times: More work needed on Astra/Oxford vaccine trials[.]" The articles explained how *The Lancet* article underscored just how far AstraZeneca's Covid vaccine was from achieving clinical success, stating, in pertinent part, as follows:

> AstraZeneca and Oxford University have more work to do to confirm whether their COVID-19 vaccine can be 90% effective, a peer-reviewed paper in *The Lancet* showed on Tuesday, potentially slowing its rollout in the fight against the pandemic.
>
> * * *
>
> ***[T]he Lancet publication gave few extra clues as to why efficacy was 62% for trial participants given two full doses, but 90% for a smaller sub-group given a half, then a full dose***.
>
> "(This) will require further research as more data becomes available from the trial," the researchers said.
>
> John Moore, virologist at Weill Cornell Medical College in New York, said the team's Lancet paper was "a hotchpotch of factoids and is hard to digest."
>
> Ian Jones, a professor of virology at Reading University in England, said that while Tuesday's data added "flesh to the bones" of the release last month, "further trial data might be needed to explain why the lower dose group was significantly better protected than the standard dose group."
>
> Asked whether the half, then full dose regimen had been a mistake, Andrew Pollard, director of the Oxford Vaccine Group and chief investigator into the trials, said it had been "unplanned."
>
> ***Less than 6% of UK trial participants were given the lower dose regimen and none of them was aged over 55, meaning more studies will be needed to investigate the vaccine's efficacy in older people who are particularly susceptible to COVID-19***.
>
> * * *

> [T]he AstraZeneca/Oxford vaccine had been seen as potentially important in tackling the COVID-19 pandemic in the developing countries, as it would be cheaper and easier to distribute if and when it is approved by regulators.
>
> "The overall efficacy across the trials . . . reported here is about 70%, but ***with a clear description of its uncertainty***," said Stephen Evans, a professor of pharmacoepidemiology at the London School of Hygiene & Tropical Medicine.
>
> He said that uncertainty meant efficacy could be as low as 55% or as high as 80%.

113. The same day, the *National Post* of Canada reported that a U.S. study of AstraZeneca's vaccine involving 30,000 volunteers was in the works. Dr. Larry Corey, a co-leader of the U.S. Coronavirus Vaccine Prevention Network who helped design and is overseeing trials for the U.S. government's Operation Warp Speed program, said that the dosing in the AstraZeneca-Oxford UK trial "wasn't done correctly. . . . One of the issues with the Oxford data is that there's a lack of uniformity in the schedule and the dose that makes interpretation of the results difficult at best[.]" There were also differences in the intervals between doses in the UK trial versus the Brazilian trial, as well as significant differences in the age range included in the studies. For example, everyone in the 90% effective group was under the age of 55, a group less susceptible to severe Covid. Should AstraZeneca decide to run a new U.S. trial testing the half-dose first option, Dr. Corey said, the U.S. was unlikely to help foot the bill.

114. On December 14, 2020, before the market opened, the *Daily Mail* published an article headlined "AstraZeneca 'would have done the study differently' if it had been in charge of Oxford's coronavirus vaccine, boss admits as UK regulator mulls over how to use jab after confusing trial found it could be 62% or 90% effective[.]" The article referred to a statement by Pangalos during a BBC Panorama television program: "There is no doubt I think that we would have run the study a little bit differently if we had been doing it from scratch." The article noted that AstraZeneca "was not part of the team that invented the vaccine, but later joined the project as a manufacturer, meaning it did not help design the first trials." According to the *Daily Mail*, "Dr. Pangalos may have been

suggesting the pharmaceutical giant would have run a trial where participants only received one dosing type, instead of two." In response, AstraZeneca's stock fell by approximately 8%.

115. On December 30, 2020, UK regulators announced the emergency approval for AstraZeneca's Covid vaccine. The emergency authorization was largely based on the interim efficacy and safety data published in *The Lancet*. The authorization recommended two full doses administered with an interval between four to twelve weeks, but ***rejected use of the half-dose regimen AstraZeneca had highlighted as more effective, saying the data did not support the finding***. According to Munir Pirmohamed, the chair of the UK's commission for Covid vaccines, the LD/SD vaccine regimen had inadequate data at that point. "The low dose/standard dose regimen, although it has been quoted to have an efficacy of 90%, this is confounded by the fact that the interval between the first and second dose was quite long[.] And we feel that that result may be related to that interval, rather than the dose itself," Pirmohamed told a news conference.

116. According to *Dow Jones*, one government health adviser said the 90% efficacy of the LD/SD cohort could be more related to a longer interval between doses than to the size of the dose itself. He said a conclusion is not possible without more data. Another adviser said that interpreting the AstraZeneca data was complicated by the design of the trials – conducted across multiple countries with differing age groups, dose intervals, and dose sizes. Even the findings published in *The Lancet* three weeks earlier could not be squared with the latest analysis, the adviser said.

117. Also on December 30, 2020, a Barclays analyst noted that AstraZeneca's share price seemed to be reacting mostly to vaccine news flow in recent weeks.

118. On January 26, 2021, German financial newspaper *Handelsblatt* and tabloid *Bild* both quoted sources in the German federal government as saying the AstraZeneca vaccine was less than

10 percent effective in people over 65 years old. The papers said German officials now fear the EMA, the EU's medicine regulator, may not approve giving the AstraZeneca vaccine to such people.

119. AstraZeneca and Germany's health ministry rejected the assertion that the efficacy of the AstraZeneca vaccine was less than 10% effective on over-65 year olds. Nevertheless, on January 28, 2021, Germany's vaccine commission advised against using AstraZeneca's coronavirus vaccines on older people. The Standing Committee on Vaccination ("STIKO") at Germany's Robert Koch Institute, the country's disease control agency, found there is insufficient data on the effectiveness of the AstraZeneca vaccine for this age group, according to a statement from the interior ministry. "Due to the small number of study participants in the age group ≥65 years, no conclusion can be made regarding efficacy and safety in the elderly. This vaccine is therefore currently recommended by STIKO only for persons aged 18-64 years," the panel said in its recommendation.

120. On January 29, 2021, the Committee for Medicinal Products for Human Use ("CHMP"), a committee of the European Medicines Agency, issued an Assessment Report on AstraZeneca's Covid vaccine. The CHMP recommended AstraZeneca's Covid vaccine for approval in patients above 18 years of age, but noted that "[e]fficacy could not be demonstrated in subjects older than 55 [years of age] due to the low number of COVID-19 cases in this age group." The level of efficacy noted by CHMP was 60%, which means ***the cohort in the UK trial that mistakenly received the wrong (half) dose was excluded from the data***.

121. In a section entitled "Uncertainties and limitations about favourable effects," the CHMP report stated, in pertinent part, as follows:

> The efficacy was based on a pooled analysis of two randomised controlled trials (COV002 and COV003). ***The conduct of studies was sub-optimal with regards to substantial changes to the protocol made after the start of studies, errors in dosing and an unplanned varying dose interval between 4 and 26 weeks***. Adaptations to

> confirmatory trials introduced without proper planning reduce the confirmatory nature of the trial. The LD/SD regime showed a better humoral response and vaccine efficacy than the SD/SD regimen. ***It is not possible to elucidate the extent to which this effect can be attributed to the administered LD/SD dose, the longer interval between the 2 doses, chance, or differences in the distribution of other factors between the SD/SD and LD/SD populations***.
>
> * * *
>
> ***Efficacy could not be demonstrated in subjects older than 55 YOA due to the low number of COVID-19 cases in this age group***. In the overall pooled efficacy set there are 8 cases in the AZD1222 group and 9 cases in the control group in subjects 56-65 years, and 2 and 6 cases in the vaccine and control group respectively in subjects older than 65 years of age. This is mostly due to the low number of subjects of this age who were recruited (13% of the pooled efficacy analysis set aged 65 years or older and 2.8% aged 75 or older), in addition to the short time of follow-up for this population – as they were enrolled after safety in adults was confirmed. ***This is considered a major limitation of the dataset since older adults are at high risk for complications upon SARS-CoV-2 infection***.

122. Also on January 29, 2021, shortly before the EMA announcement, French President Emmanuel Macron said, "[t]he real problem with AstraZeneca is that it hasn't worked the way we expected. Because we've had very little information[.]" So far, he said, "everything seems to indicate that it's quasi ineffective for people older than 65 years old, some say 60 years and above."

123. In response, the price of AstraZeneca ADSs declined by 7% from January 26, 2021 through January 29, 2021.

POST-CLASS PERIOD EVENTS

124. On February 1, 2021, *Reuters* reported that the LD/SD dosing mishap was presented to the trial participants in a letter dated June 8, 2020 as an opportunity for Oxford researchers to learn how well the vaccine works at different doses. The letter was signed by the trial's chief investigator, Oxford professor Andrew J. Pollard, and sent to the trial subjects. The Pollard letter did not acknowledge any error. Nor did it disclose that researchers had reported the issue to British medical regulators, who then told Oxford to add another test group to receive the full dose, in line with the trial's original plan.

125. *Reuters* shared the letter – which it obtained from the university through a Freedom of Information request – with three different experts in medical ethics. The ethicists all said it indicates the researchers may not have been transparent with trial participants. Volunteers in clinical trials are supposed to be kept fully informed about any changes.

126. Steve Pritchard, a spokesman for Oxford, told *Reuters*: "The half-dose group was unplanned, but we did know in advance that there was a discrepancy in the dose measurements and discussed this with the regulators before dosing and when the dosing was revised."

127. During an earnings conference call on February 11, 2021, Jeremy Kahn, a writer for *Fortune*, highlighted concerns about AstraZeneca's credibility and transparency concerning its Covid vaccine, stating, in pertinent part, as follows:

> On the vaccine, there have been a number of stumbles around how things have been communicated, starting with the two suspected adverse events in the UK clinical trial over the summer. Then there was the issue around when AstraZeneca could declare the pandemic over. There was some confusion over the half-dose versus the full-dose results when those were initially announced, the issue around the price in South Africa, the issue around the distribution in Europe. ***In each case there has been this controversy over whether the company has been completely transparent in its initial communication. Some now feel the company is suffering from a credibility gap that has weighed on the share price***.

128. On March 22, 2021, AstraZeneca announced that results of a large U.S. trial showed its Covid vaccine to be 79% effective in preventing symptomatic illness and 100% effective against severe disease and hospitalization. Ruud Dobber, executive vice president of AstraZeneca's biopharmaceuticals business unit, said, "[w]e are thrilled by the results we have disclosed this morning. The plan is to file in the first half of April for the emergency use authorization and, of course, then it is in the hands of the FDA how fast they can decide about the approval."

129. The next day, however, the integrity of AstraZeneca's vaccine data took another hit when independent monitors took the extraordinary step of questioning the Company's portrayal of its data – a move that cast doubt on the fate of the vaccine in the U.S. In a memo sent to

AstraZeneca and U.S. government officials, and obtained by the *Washington Post*, experts who had been overseeing the vaccine trial expressed concern and disappointment that AstraZeneca had presented "outdated and potentially misleading" data on its coronavirus vaccine, making the shots appear more effective than shown by fuller data. AstraZeneca's news release the previous day triggered concern because when an additional month was taken into account, the effectiveness ranged from 69-75%, rather than 79%.

130. The March 23, 2021 memo came from the Data and Safety Monitoring Board ("DSMB") – 11 leading statisticians, infectious-disease physicians, and ethics experts appointed by the U.S. National Institutes of Health to review trial data for all the major coronavirus vaccines supported by the federal government. It said AstraZeneca's decision to use early data that put the vaccine in the most favorable light was a deliberate attempt to make its results seem better than they were. "The DSMB is concerned that AstraZeneca chose to use data that was already outdated and potentially misleading in their press release," the memo stated. The data "they chose to release was the most favorable for the study as opposed to the most recent and most complete. Decisions like this are what erode public trust in the scientific process."

131. According to a March 23, 2021 *Washington Post* article, outside experts, who were stunned by the turn of events, said the vaccine might still get FDA clearance, only to be shunned by a public spooked by the string of controversies involving AstraZeneca and Oxford. "The whole thing has been a giant debacle, and it is entirely on AstraZeneca," said Angela Rasmussen, a virologist with Georgetown University's Center for Global Health Science and Security. "Are people going to want to take the vaccine? People may think, 'There's too much going on with this vaccine, and I want something that is more reliable.'" The *Washington Post* noted that this misstep was just the latest in a series of missteps in the collaboration between AstraZeneca and Oxford:

"First, there was confusing basic science, then missed delivery targets. Last week, a confidence-sapping pause in Europe followed reports of rare blood clots among a handful of the vaccinated. And now comes pushback from independent monitors over AstraZeneca's interpretation – and claims – of effectiveness in the U.S. clinical trials."

132. On April 29, 2021, the *Wall Street Journal* reported that U.S. health and industry officials have said publicly that the U.S. has ordered so many doses of already-FDA-approved shots from Pfizer, Moderna, and Johnson & Johnson that it might not need AstraZeneca's Covid vaccine.

133. As a result of Defendants' wrongful acts and omissions, Plaintiffs and the Class (as defined below) purchased AstraZeneca ADSs at artificially inflated prices and suffered significant losses and were damaged thereby.

NO SAFE HARBOR

134. Defendants' "Safe Harbor" warnings accompanying AstraZeneca's reportedly forward-looking statements ("FLS") issued during the Class Period were ineffective to shield those statements from liability. Because most if not all of the false and misleading statements related to existing facts or conditions, the Safe Harbor has no applicability. To the extent that known trends should have been included in the Company's financial reports prepared in accordance with Generally Accepted Accounting Principles, they are excluded from the protection of the statutory Safe Harbor. 15 U.S.C. §78u-5(b)(2)(A).

135. Defendants are also liable for any false or misleading FLS pleaded because, at the time each FLS was made, the speaker knew the FLS was false or misleading and the FLS was authorized and/or approved by an executive officer and/or director of AstraZeneca who knew that the FLS was false. In addition, the FLS were contradicted by existing, undisclosed material facts that were required to be disclosed so that the FLS would not be misleading. Finally, most of the

purported "Safe Harbor" warnings were themselves misleading because they warned of "risks" that had already materialized or failed to provide any meaningful disclosures of the relevant risks.

ADDITIONAL SCIENTER ALLEGATIONS

136. As alleged herein, Defendants acted with scienter in that they knew that the public documents and statements issued or disseminated in the name of the Company were materially false and misleading; knew that such statements or documents would be issued or disseminated to the investing public; and knowingly and substantially participated or acquiesced in the issuance or dissemination of such statements or documents and actions intended to manipulate the market price of AstraZeneca ADSs as primary violations of the federal securities laws. Defendants, by virtue of their receipt of information reflecting the true facts regarding AstraZeneca, their control over, and/or receipt or modification of AstraZeneca's allegedly materially misleading misstatements and/or their associations with the Company which made them privy to confidential proprietary information concerning AstraZeneca, participated in the fraudulent scheme alleged herein.

137. Notably, the adverse developments at issue impacted one of AstraZeneca's most important and high-profile drug candidates, AZD1222. Governments, media, and the general public around the world were closely watching Defendants' progress in the development of AZD1222, and the Individual Defendants repeatedly held themselves out to investors as the employees most knowledgeable on the subject and stated that they had significant visibility into progress on the drug candidate's development. For example, on September 8, 2020, AstraZeneca CEO Soriot personally signed a personal "pledge" to "ensure public confidence in the rigorous scientific and regulatory process by which COVID-19 vaccines are evaluated and may ultimately be approved."

138. Moreover, although development of AZD1222 was initiated by Oxford, development activities were subsequently transferred to AstraZeneca, which took over responsibility for planning the U.S. trials. AstraZeneca itself received $1.2 billion from the U.S. government to develop and

manufacture 300 million doses of the vaccine. As such, the Individual Defendants knew or were reckless in not knowing of the undisclosed facts detailed herein.

139. Further, Defendants were aware of the LD/SD protocol change by no later than June 5, 2020. According to the *Wall Street Journal* and *Postmedia Breaking News*, both AstraZeneca and Oxford informed health regulators about the half-dose followed by the full-dose error, and amended the study protocol on June 5, 2020 – less than two weeks before the start of the Class Period.

140. In addition, Defendants were motivated to artificially inflate AstraZeneca's stock price in order to fund the Company's December 2020 acquisition of Alexion Pharmaceuticals, two-thirds of which was funded with AstraZeneca shares. The terms of the deal gave Alexion shareholders $60 in cash and approximately $115 worth of equity per share. At a cost of $39 billion, Alexion was AstraZeneca's largest-ever corporate acquisition.

LOSS CAUSATION

141. During the Class Period, as detailed herein, Defendants engaged in a scheme to deceive the market and a course of conduct that artificially inflated the price of AstraZeneca ADSs and operated as a fraud or deceit on purchasers of AstraZeneca ADSs. As detailed above, when the truth about AstraZeneca's misconduct was revealed over time, the value of the Company's ADSs declined precipitously as the prior artificial inflation no longer propped up the price of the ADSs. The declines in the price of AstraZeneca ADSs were the direct result of the nature and extent of Defendants' fraud finally being revealed to investors and the market. The timing and magnitude of the share price declines negate any inference that the losses suffered by Plaintiffs and other members of the Class were caused by changed market conditions, macroeconomic or industry factors, or Company-specific facts unrelated to Defendants' fraudulent conduct. The economic loss, *i.e.*, damages, suffered by Plaintiffs and other Class members, was a direct result of Defendants'

fraudulent scheme to artificially inflate the price of the Company's ADSs and the subsequent significant decline in the value of the Company's ADSs when Defendants' prior misrepresentations and other fraudulent conduct were revealed.

142. At all relevant times, Defendants' materially false and misleading statements or omissions alleged herein directly or proximately caused the damages suffered by Plaintiffs and other Class members. Those statements were materially false and misleading through their failure to disclose a true and accurate picture of AstraZeneca's business, operations and financial condition, as alleged herein. Throughout the Class Period, Defendants issued materially false and misleading statements and omitted material facts necessary to make Defendants' statements not false or misleading, causing the price of AstraZeneca's ADSs to be artificially inflated. Plaintiffs and other Class members purchased AstraZeneca ADSs at artificially inflated prices, causing them to suffer damages as complained of herein.

APPLICABILITY OF PRESUMPTION OF RELIANCE: FRAUD-ON-THE-MARKET DOCTRINE

143. At all relevant times, the market for AstraZeneca ADSs was an efficient market for the following reasons, among others:

(a) AstraZeneca ADSs met the requirements for listing and were listed and actively traded on the NYSE and later the NASDAQ during the Class Period, both highly efficient and automated markets;

(b) according to the Company's Form 20-F filed March 3, 2020, there were more than 1.3 billion AstraZeneca ordinary shares outstanding as of December 31, 2019, demonstrating a very active and broad market for the AstraZeneca ADSs referencing those ordinary shares;

(c) as a regulated issuer, AstraZeneca filed periodic public reports with the SEC;

(d) AstraZeneca regularly communicated with public investors via established market communication mechanisms, including the regular dissemination of releases on national circuits of major newswire services, the Internet, and other wide-ranging public disclosures; and

(e) unexpected material news about AstraZeneca was rapidly reflected in and incorporated into the Company's ADSs price during the Class Period.

144. As a result of the foregoing, the market for AstraZeneca ADSs promptly digested current information regarding AstraZeneca from publicly available sources and reflected such information in AstraZeneca's ADS price. Under these circumstances, all purchasers of AstraZeneca ADSs during the Class Period suffered similar injury through their purchase of AstraZeneca ADSs at artificially inflated prices, and a presumption of reliance applies.

145. A Class-wide presumption of reliance is also appropriate in this action under the Supreme Court's holding in *Affiliated Ute Citizens of Utah v. United States*, 406 U.S. 128 (1972), because the Class's claims are, in large part, grounded on Defendants' material misstatements and/or omissions. Because this Action involves Defendants' failure to disclose material adverse information regarding the Company's business operations and financial prospects – information that Defendants were obligated to disclose – positive proof of reliance is not a prerequisite to recovery. All that is necessary is that the facts withheld be material in the sense that a reasonable investor might have considered them important in making investment decisions. Given the importance of the Class Period material misstatements and omissions set forth above, that requirement is satisfied here.

CLASS ACTION ALLEGATIONS

146. This is a class action on behalf of all purchasers of AstraZeneca ADSs during the Class Period who were damaged thereby (the "Class"). Excluded from the Class are Defendants and their families, the officers and directors of the Company, at all relevant times, members of their

immediate families and their legal representatives, heirs, successors or assigns, and any entity in which Defendants have or had a controlling interest.

147. Common questions of law and fact predominate and include: (a) whether Defendants violated the Exchange Act; (b) whether Defendants omitted and/or misrepresented material facts; (c) whether Defendants knew or recklessly disregarded that their statements were false; (d) whether the price of AstraZeneca ADSs was artificially inflated during the Class Period; and (e) the extent of and appropriate measure of damages.

148. The members of the Class are so numerous that joinder of all members is impracticable. Throughout the Class Period, AstraZeneca ADSs were actively traded on the NYSE and the NASDAQ. Upon information and belief, these shares are held by hundreds or thousands of individuals located geographically throughout the country.

149. Plaintiffs' claims are typical of those of the Class. Prosecution of individual actions would create a risk of inconsistent adjudications. Plaintiffs will adequately protect the interests of the Class. A class action is superior to other available methods for the fair and efficient adjudication of this controversy.

COUNT I

For Violation of §10(b) of the Exchange Act and Rule 10b-5 Against All Defendants

150. Plaintiffs incorporate ¶¶1-149 by reference.

151. During the Class Period, Defendants disseminated or approved the false or misleading statements specified above, which they knew or recklessly disregarded were misleading in that they contained misrepresentations and failed to disclose material facts necessary in order to make the statements made, in light of the circumstances under which they were made, not misleading.

152. Defendants violated Section 10(b) of the Exchange Act and Rule 10b-5 in that they, directly and indirectly, by the use of the means or instrumentality of interstate commerce, or the mails or facility of a national securities exchange:

(a) employed devices, schemes and artifices to defraud;

(b) made untrue statements of material fact or omitted to state material facts necessary in order to make the statements made, in light of the circumstances under which they were made, not misleading; or

(c) engaged in acts, practices and a course of business that operated as a fraud or deceit upon Plaintiffs and others similarly situated in connection with their purchases of AstraZeneca ADSs during the Class Period.

153. Plaintiffs and the Class have suffered damages in that, in reliance on the integrity of the market, they paid artificially inflated prices for AstraZeneca ADSs. Plaintiffs and the Class would not have purchased AstraZeneca ADSs at the prices they paid, or at all, if they had been aware that the market prices had been artificially and falsely inflated by Defendants' misleading statements.

154. By virtue of the foregoing, Defendants have violated Section 10(b) of the Exchange Act, and Rule 10b-5 promulgated thereunder.

155. As a direct and proximate result of Defendants' wrongful conduct, Plaintiffs and the other members of the Class suffered damages in connection with their purchases of AstraZeneca ADSs during the Class Period.

COUNT II

For Violation of §20(a) of the Exchange Act Against the Individual Defendants

156. Plaintiffs incorporate ¶¶1-155 by reference.

157. During the Class Period, the Individual Defendants acted as controlling persons of AstraZeneca within the meaning of Section 20(a) of the Exchange Act. By virtue of their share ownership, executive and Board positions, and ADS ownership, and their culpable participation, as alleged above, the Individual Defendants had the power to influence and control and did, directly or indirectly, influence and control the decision making of the Company, including the content and dissemination of the various statements that Plaintiffs contend were false and misleading as detailed herein.

158. The Individual Defendants were provided with or had unlimited access to the Company's internal reports, releases, public filings, and other statements alleged by Plaintiffs to be misleading prior to or shortly after these statements were issued, and had the ability to prevent the issuance of the statements or cause them to be corrected. In particular, the Individual Defendants had direct involvement in and responsibility over the day-to-day operations of the Company and, therefore, are presumed to have had the power to control or influence the particular transactions giving rise to the securities violations as alleged herein.

159. By reason of such wrongful conduct, the Individual Defendants are liable pursuant to Section 20(a) of the Exchange Act.

160. As a direct and proximate result of the Individual Defendants' wrongful conduct, Plaintiffs and the other members of the Class suffered damages in connection with their purchases of the Company's ADSs during the Class Period.

PRAYER FOR RELIEF

WHEREFORE, Plaintiffs pray for judgment as follows:

A. Determining that this Action is a proper class action and certifying Plaintiffs as Class representatives under Rule 23 of the Federal Rules of Civil Procedure and Plaintiffs' counsel as Class Counsel;

B. Awarding compensatory damages in favor of Plaintiffs and the other Class members against all Defendants, jointly and severally, for all damages sustained as a result of Defendants' wrongdoing, in an amount to be proven at trial, including interest thereon;

C. Awarding Plaintiffs and the Class their reasonable costs and expenses incurred in this action, including counsel fees and expert fees; and

D. Awarding such other and further relief as the Court may deem just and proper.

JURY DEMAND

Plaintiffs demand a trial by jury.

DATED: July 12, 2021

ROBBINS GELLER RUDMAN
& DOWD LLP
SAMUEL H. RUDMAN
ALAN I. ELLMAN
WILLIAM J. GEDDISH
MAGDALENE ECONOMOU

/s/ Samuel H. Rudman
SAMUEL H. RUDMAN

58 South Service Road, Suite 200
Melville, NY 11747
Telephone: 631/367-7100
631/367-1173 (fax)
srudman@rgrdlaw.com
aellman@rgrdlaw.com
wgeddish@rgrdlaw.com
meconomou@rgrdlaw.com

POMERANTZ LLP
JEREMY A. LIEBERMAN
J. ALEXANDER HOOD II
JAMES M. LOPIANO
MURIELLE J. STEVEN WALSH
ERIC D. GOTTLIEB
600 Third Avenue
New York, NY 10016
Telephone: 212/661-1100
212/661-8665 (fax)
jalieberman@pomlaw.com
ahood@pomlaw.com
jlopiano@pomlaw.com
mjsteven@pomlaw.com
egottlieb@pomlaw.com

POMERANTZ LLP
PATRICK V. DAHLSTROM
10 South LaSalle Street, Suite 3505
Chicago, IL 60603
Telephone: 312/377-1181
312/377-1184 (fax)
pdahlstrom@pomlaw.com

Attorneys for Lead Plaintiffs

VANOVERBEKE, MICHAUD TIMMONY, P.C.
THOMAS C. MICHAUD
79 Alfred Street
Detroit, MI 48201
Telephone: 313/578-1200
313/578-1201 (fax)
tmichaud@vmtlaw.com

Additional Counsel for Lead Plaintiff Wayne County Employees' Retirement System

PORTNOY LAW FIRM
LESLEY F. PORTNOY
1800 Century Park East, Suite 600
Los Angeles, CA 90067
Telephone: 310/692-8883

Additional Counsel for Lead Plaintiff Nuggehalli Balmukund Nandkumar

BRONSTEIN, GEWIRTZ
& GROSSMAN, LLC
PERETZ BRONSTEIN
60 East 42nd Street, Suite 4600
New York NY 10165
Telephone: 212/697-6484
212/697-7296 (fax)
peretz@bgandg.com

Additional Counsel for Additional Plaintiff Vladimir Zhukov

CERTIFICATE OF SERVICE

I hereby certify under penalty of perjury that on July 12, 2021, I authorized a true and correct copy of the foregoing document to be electronically filed with the Clerk of the Court using the CM/ECF system, which will send notification of such public filing to all counsel registered to receive such notice.

/s/ Samuel H. Rudman

SAMUEL H. RUDMAN

ROBBINS GELLER RUDMAN
& DOWD LLP
58 South Service Road, Suite 200
Melville, NY 11747
Telephone: 631/367-7100
631/367-1173 (fax)
srudman@rgrdlaw.com